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AUTHOR Parker, Lorne A., Comp.; Olgren, Christine H., Comp.
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ABSTRACT

This publication contains more than 50 papers on the latest developments and applications of interactive media to link distant locations. The contributors, who represent business, government, education, medical, and telecommunications organizations in the United States, Canada, England, and Australia, have had direct experience with the full range of interactive systems including audioconferencing, audiographics, slow scan televideo, full motion video conferencing, computer conferencing, computer messaging systems, and videotex service. Further, they have used all channels to reach distant locations, i.e., telephone, cable, microwave, and satellite. The intent of the publication is to give a perspective on the field from the vantage points of the user, administrator, instructional designer, researcher, technical designer, and product manufacturer. The papers are grouped in five categories: Teleconferencing in Business and Government, Teleconferencing in Education, Teleconferencing in Health and Medicine, Program Design and Research, and Computer Conferencing and Messaging Systems. (Author/MER)

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Teleconferencing and Interactive Media

University of Wisconsin-Extension
Center for Interactive Programs
1980

Compiled by

Lorne A. Parker
Christine H. Olgren

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Introduction

More and more people around the world are using interactive media to link distant locations. Many others are exploring potential uses in their organizations. Why? Because of changing communications needs, better technology and new applications.

Consider teleconferencing. It brings people together for immediate interaction, spanning geographic distance and overcoming time and energy constraints. This capability has led people to adapt teleconferencing to meet multiple communication needs, including meetings, instruction, training, consultation and many other functions.

Because of better technology, teleconferencing systems are also more flexible. They may use telephone, cable, microwave or satellite channels. A system can link three people or hundreds of locations. Not only can participants hear and speak to each other in audio conferences, but there are many visual dimensions: slow scan televideo to send pictures over telephone lines, electronic blackboards or tablets for hand-drawn graphics, facsimile systems to exchange paper copies, and sophisticated conferencing rooms with full motion video.

Interactive media offer other options as well. These include computer conferencing and electronic mail systems such as communicating word processors, intelligent copiers and store-and-forward message systems. And viewdata services promise to turn even the home into an interactive information center.

Teleconferencing and other interactive media are reaching out to improve communications, but they also raise critical issues:

> What are the uses, benefits and costs of audio and video systems?
>
> What are the future trends for communications satellites?
>
> How can computer conferencing/computer messaging systems and videotex services best be used?
>
> How can teleconferencing and other interactive systems be integrated?

These are some of the important issues addressed in this publication.

Teleconferencing and Interactive Media is a significant publication. It contains more than 50 papers on the latest developments and applications of interactive media -- an indication of the awareness, interest and importance of this field.

The contributors represent business, government, education, medical and telecommunications organizations in the United States, Canada, England and Australia. Together they give a perspective on the field from many vantage points: that of user, administrator, instructional designer, researcher, technical designer and product manufacturer.

They have had direct experience with the full range of interactive systems including audio conferencing, audiographics, slow scan televideo, full motion video conferencing, computer conferencing, computer messaging systems and videotex services. And, finally, they have used all channels to reach distant locations -- telephone, cable, microwave and satellite.

The papers here are grouped into five categories: Teleconferencing in Business and Government, Teleconferencing in Education, Teleconferencing in Health and Medicine, Program Design and Research, and Computer Conferencing and Messaging Systems.

We hope these divisions will be useful to readers. We recognize, however, that several papers could easily be grouped into multiple categories.

A publication of this scale deserves thanks to many people. Special acknowledgment must go to the "Teleconferencing and Interactive Media" advisory committee: John Daniel, Athabasca University; Donald Didcoct, University of Wisconsin; Samuel Fordyce, NASA; Thomas Hoff, Roche Laboratories; Robert Johansen, Institute for the Future; Anthony Marsh, Bell Northern Research; Christopher Stockbridge, Bell Telephone Laboratories; and Elizabeth Young, Public Service Satellite Consortium.

Obviously, many thanks go to the authors of these papers for sharing their expertise and experiences.

Special thanks also to Paul Edison-Swift, graduate student with Instructional Communications Systems (ICS), who helped implement sections of this publication; to Marcia Baird, assistant director of ICS, for her advice and assistance; and to Jan Shimanski, graduate student with the Center for Interactive Programs (CIP), for her help in organizing the papers. And, finally, in appreciation of her efforts in guiding this publication, this book is specifically dedicated to Diane Chalgren, CIP program assistant.

Lorne A. Parker
Director

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AN EXPERIENCE IN APPLYING TELECONFERENCING TO THE HOLDING AND COORDINATION OF A NATIONAL SALES MEETING

Thomas W. Hoff
Director
Communications Development
Roche Laboratories
Division of Hoffmann-La Roche Inc.
Nutley, New Jersey 07110

The Department of Communications Development of the Roche Laboratories Division of Hoffmann-La Roche, Inc. was formed about three years ago to identify, test and integrate new communications techniques, technologies, media and concepts into our marketing and internal communications activities. Shortly after the establishment of the group, one of its members prototyped an acoustically coupled speakerphone capable of remotely triggering a carousel projector. The existence of this device led to a rather intensive and extensive search of the world literature on research in teleconferencing and to the making of a number of personal contacts with individuals actively involved in practicing the art.

During the ensuing several months, a variety of scenarios were developed in which teleconferencing could be productively employed to help:

1. Market a new product.
2. Provide continuing professional education to remote groups of health care professionals.
3. Train district sales managers and salespeople.
4. Hold and coordinate sales meetings.
5. Provide individual salespeople with home office technical support.

In order to gain management funding and support to develop and test these scenarios, it was decided to make a presentation to management via teleconferencing. In other words, use the media to present/inform/promote the media.

On December 14, 1976, using the prototype speakerphone and a carousel projector, a presentation was made which clearly developed the cost versus travel versus time-saving potentials of portable audio teleconferencing, coupled with pre-mailed graphics (slides, videotape, flip charts, etc.). A scenario was painted which showed the potentials for application by members of each of the departments represented by the management group. These included field sales management, sales promotion, distribution, professional services, marketing research, product management, and sales training.

The presenters were located in a room on another floor. They were able to openly dialog with the management group and controlled the slides by push button. The net effect was not very different from the typical business presentation in which one or several individuals appear before a group and present a fairly well thought out presentation using slides, flip charts or overheads.

The net result of the presentation was a set of specific agreements to proceed in the development of a variety of pilot tests. Worthy of note here is the technique by which these specific agreements were obtained. The presenters had previously placed a flip chart and felt pen in the conference room occupied by the management group. At the conclusion of the presentation, they asked one of the group to act as scribe and jot down the names of individuals to be assigned to work on a teleconference pilot with Communications Development. The presenters then polled the management group -- one at a time -- to solicit a person's name from each management area -- a great technique that would not have worked any better face-to-face and which clearly demonstrated one of the potentials of the media.

During the two years following this presentation, specific pilot projects were initiated, completed and assessed in each area. Teleconferencing has become a regularly considered/utilized communications alternative within our organization.

For purposes of this case study, one of our applications will be reviewed.

Our sales organization is composed of approximately 60 divisions of 10 to 12 people (for each division) including a local division manager. The divisions are organized in eight regions, four in a north area and four in a south area. In May 1978, sales management found it necessary to rapidly organize sales meetings for the purpose of communicating some important new strategic and follow-up information on a newly launched product and on another major product. The information they wished to communicate required the direct involvement of the two involved product marketing teams. Opportunity for direct and open dialog between the salespeople and product and top management was deemed essential.

The only way to facilitate this personal, direct dialog in the past was by arranging either large regional or national meetings. In this instance, the time pressures and budget mitigated against such a strategy. The lead times were far too short to secure adequate hotel space for June meetings. At this point, sales management asked if and how teleconferencing could help. The goal was to let each of the 60 individual divisions meet in a local hotel in their base city, which would reduce hotel and travel costs and reduce lost field time.

A proposal was pulled together in a few days and accepted. The objectives and content are summarized as follows:

- to maximize communication between field staff and home office/marketing personnel
- to maximize inter-regional communication
- to minimize dollar and other costs of extensive travel and work time lost for both home office and field people
- to eliminate the arduous task of separate repetitive presentations by home office management to each of the eight sales regions
- to decrease the tremendous expenses associated with hosting large assemblages of sales representatives and management at traditional national or regional meetings

The meeting was to begin with opening messages beamed from the home office from the general sales manager to the entire field staff and from the area and regional sales managers addressing their respective people. The national sessions focused on two product areas. Major audio presentations would be made from the home office for these two products, supplemented by synchronized on-site videotapes and slides. The product teams at the home office would present sales objectives and strategies and would be available on the teleconferencing "bridge" to respond to questions from field staff members. Each division would be able to hook up on a rotating basis with the product team panels to get immediate answers, thereby enabling the various divisions to hear answers to problems similar to their own as manifest in other sales areas. The national teleconference sessions were then followed by divisional workshops held at the various meeting sites to address specific areas of concern to each division and by a final Q & A teleconference with the respective product team at the scheduled conclusion of the workshops.

Approximately six weeks later, our national teleconferencing media was up and running.

Prior to the national meeting, there were meetings of division sales managers to discuss meeting plans. These meetings made use of teleconferencing and provided the mechanism for introducing the concept and for the training of each division manager in the fine points of hooking up and using the teleconferencing equipment. At each site, a member of the home office staff hooked up a Darome acoustic convener and dialed their "meet me" bridge at the appointed hour. One of the members of our department then remotely presented an interactive slide presentation to all of the division managers assembled demonstrating equipment hookup, etc. During these meetings (or shortly after in the mail), all of the division managers received the slides, videotapes, conveners, telephone credit cards, bridge numbers, meeting flow outline, schedule and other materials they would need for the national teleconference meeting.

One of the most complicated and most critical aspects of the preparation for the teleconference was the creation of the master teleconference meeting schedule. Since the bridge could handle only 40 lines, the meeting was designed to allow the teleconferencing portion to shift between the 30 northern area divisions and the 30 southern area divisions. See example schedule attached for June 12 and 13. Note that the key was to have the north sales area discuss and work on products A and B on June 12 while the southern sales area worked on other issues. On June 13, they reversed.

The time zone situation created another scheduling concern. The divisions on the West Coast had to be on line at 7:00 a.m. local time while those in the East did not have to start until 10:00 a.m. The Westerners were through early, the Easterners worked into the evening.

As mentioned previously, we utilized the Darome acoustic convener, an instrument with which we had had previous satisfactory experience. This unit made it possible to avoid all of the hassles of arranging 60 special lines to be put into 60 different hotels serviced by various Bell companies as well as several independents. The only local requirement was to be sure the meeting room selected had a phone from which outside calls could be placed. A further necessity was to review with the local hotel management and its switchboard operator that the line would be in rather constant use and to ask the operator not to disconnect it.

All of our managers have video playback equipment. Most have access to slide projectors and screens and most hotels can supply any of these items with little advance notice. Therefore, all AV equipment was supplied locally.

We utilized the Darome teleconference services "meet-me" bridge. The operators served as timekeepers and meeting expediters to assure that the schedule was maintained. They, therefore, stayed "on line" at all times so they could step in to problem solve, if necessary. They were given the responsibility of interjecting to advise a speaker that his equipment was not functioning properly, his line was bad, or his speaking voice was too weak. They also could pull people out of the bridge in order to troubleshoot any technical problems with them.

Since this was both Darome's and our first experience with a conference of this size, once a scheduled conference was set up, each site was generally left on line after the scheduled presentation/discussion until the next use. This was done to make things simpler for the sites and because of our uncertainty as to whether all sites could be dropped and reset reliably several times each day. Simply put, we felt, once we've got 'em, let's hold onto 'em. This long-term hook up, while much more expensive, did allow a number of impromptu conferences between various divisions to be set up for idea sharing, problem solving, etc. All a site had to do was advise the bridge.

As can be seen from the master schedule, all sites knew what visual element they would be using for each part of the teleconference. In the case of the slides, all slides were numbered in the transparency portion so as to be visible on the projection screen. The presenter could thus merely ask for the slide by number and be assured that "everyone out there" was looking at the same thing. Videotapes also bore large numbers, i.e., Tape 1, etc.

Every attempt was made to include Dr. Lorne Parker's basic teleconferencing guidelines. All speakers were introduced with a picture to help establish presence. Long speeches without dialog were avoided. Humanizing was fairly easily accomplished as all participants were well known to each other.

Two "sending" sites were established in the home office -- one for each product team. These sites used hard wired conveners and were fitted with all of the same audiovisual equipment that was at the remote hotel sites. Backup acoustic conveners on a separate line were also in place.

In addition, a "listening post" identical to a remote hotel site was set up and any and all home office staff was invited to drop in and listen in at their leisure.

The other presenters, such as the general sales manager, area sales managers, and regional sales managers, made their various presentations or served on Q & A panels, etc., directly from the remote sites they were visiting. This tended to add a "between us" to the national scope aspect of the meeting and reduced the top down from the home office impact.

Technically, the national teleconference sales meeting worked quite well. There were occasional sites that improperly hooked up their acoustic couplers but they were usually quickly remediated. Transmission from the home office was lost for a couple of minutes once.

The single major problem occurred on the second day. Just after all sites called in and the operator was about to turn the conference over to one of the product teams, a local power failure hit the Bell ESS station, and all lines were dropped. Within 10 minutes, every site recognized (via busy signals) that they had been dropped and redialed -- a great testimonial to the training they had received and to the flexibility of the "meet-me" system.

Our assessment of the national conference as a substitute for a major (central or regional site) meeting is positive. A rather extensive post-meeting survey was conducted among division managers and sales representatives. The results indicate that:

- The participants did not feel there were serious technical problems, i.e., couldn't hear, couldn't get on line, although 40 percent reported observing some sort of technical problem.
- The participants enjoyed hearing from the top management people who addressed them. They liked getting immediate authoritative answers to questions and hearing positions, etc. of colleagues at other sites.
- 70 percent thought that the meeting was equal to or better than previously attended large meetings without teleconferencing.
- Some participants, especially the division managers, felt that the rigid schedule imposed by teleconferencing created an undesirable amount of inflexibility and clock watching pressure.
- Some felt that the Q & A portions were too large to encourage maximum interaction.

Some of the additional observations made are worth reporting here. This media can prove to expedite the feedback/decision process. The need to make a major strategic promotional change was uncovered during several sessions and confirmed by linking all sites together. A decision to effect this change was literally made on the spot by adding into the national conference the appropriate key management personnel. The normal time frame for such feedback to be confirmed, a decision made and then communicated could be measured in weeks.

We also discovered that this media can minimize some of the psychological barriers of face-to-face meetings. When a question was asked by one of the sites, it was in effect being asked by the group of peers in that room, with the group's full support. The home office person's answers were judged by all sites. This occasionally resulted in bold demands for straight, decisive answers as the asking group had the compunction to challenge the respondent.

While some of the participants found the tight scheduling a problem, some of the home office personnel felt that it tended to force coverage of all the material and assured all agenda items were addressed.

From a cost point of view, considerable economies were indeed realized based on the savings realized on travel and hotel space alone. These savings -- well in excess of $100,000 -- do not include the lost field/office time that would have occurred by transporting 600 plus salespeople to regional, area or national type meetings and 15 to 20 executives to those same sites.

There are no specific plans for using teleconferencing on this scale in the near future. It will, however, be a viable alternative as each subsequent sales meeting is considered. The teleconference technique is, however, regularly utilized by field management for weekly/monthly communications, feedback and problem-solving purposes.

***

EXAMPLE

NATIONAL TELECONFERENCED SALES MEETING
North Area
Monday, June 12 and Tuesday, June 13

* Denotes on-line teleconference

Pacific	Mountain	Central	Eastern
6:30 am*	7:30 am*	8:30 am*	9:30 am*

Call Darome bridge using credit card and assigned regional bridge telephone number.

7:00* 8:00* 9:00* 10:00*

(on-line) Meeting begins - Field Sales Manager introduces General Sales Manager and welcomes group. (Have slide tray #1 on carousel and ready to go.)

7:05* 8:05* 9:05* 10:05*

(on-line) General Sales Manager's talk. Slies 1-30

7:20* 8:20* 9:20* 10:20*

(on-line) Field Sales Manager/Regional Sales Manager provide meeting overview. Slides 30-41

7:40* 8:40* 9:40* 10:40*

(on-line) Product A overview -- Product Director introduced by Field Sales Manager. Use videotape #1 product A.

7:45 8:45 9:45 10:45

(off-line) Product A workshop conducted by Division Sales Managers - Use moderator's guide as suggested flow, utilize resources specified.

> Note: During the six-hour workshop, regional Sales Planning Manager will tap into each division -- to answer questions, provide input, etc. DO NOT HANG UP YOUR PHONE DURING THIS PERIOD! (Lunch to be taken during this six-hour period.)

1:45* 2:45* 3:45* 4:45*

(on-line) Area Q & A with teams, Field Sales Manager, General Sales Manager.

2:45 3:45 4:45 5:45

(off-line) Product B - Bridge operator will instruct when to play product B videotape #1.

2:47 3:47 4:47 5:47

(on-line) Status Update - Product Director for product B will instruct when to play product B videotape #2.

> The next half hour consists of various presentations by members of the marketing group for product B.

3:20 4:20 5:20 6:20

(off-line) Each Division Sales Manager writes down questions (maximum of three) his division would like to ask the product B team. (Darome operator will explain process before meeting segment.)

3:30* 4:30* 5:30* 6:30*

(on-line) Product B team will randomly poll divisions and answer questions. Ample time will be allowed to divisions with unanswered questions to ask the team.

4:00 5:00 6:00 7:00

(off-line) Product B workshop (1 hour).

5:00* 6:00* 7:00* 8:00*

Regional Sales Manager wrap-up (10 minutes) to his respective region.

Day 2

No teleconferencing - local divisional business meetings.

Day sequence reversed for 30 divisions in southern area.

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AMERICAN SATELLITE CORPORATION COMMUNICATIONS SERVICES

Townsend D. Breeden
Assistant Vice President, Government Systems
American Satellite Corporation
Germantown, Maryland

The ability to transmit large amounts of business information door-to-door, coast-to-coast, or around the world—and do it economically—is an important service to industry and government.

American Satellite Corporation (ASC), headquartered in Germantown, Maryland, began providing business and government users with communications services via satellite more than five years ago.

Today, American Satellite is a growing company that provides private line voice, data, facsimile, and business video services to a varied mix of major corporation, governmental agencies, and specialized users. These services are summarized in Figure 1.

During the past six years, ASC operated as a wholly owned subsidiary of Fairchild Industries, Inc. On August 21, 1979, an agreement was reached between Fairchild Industries and Continental Telephone Corporation, the nation's third largest independent (non-Bell) telephone company, to establish a joint satellite communications venture with intent to continue and expand the business conducted by American Satellite Corporation as equal partners. The operation of the joint venture is subject to prior approval of the Federal Communications Commission.

American Satellite has been leasing its required satellite capacity from Western Union under long term agreements. On December 21, 1979, American Satellite entered into an agreement with Western Union to purchase a 20 percent ownership interest in the Westar domestic communications satellite system. That system presently consists of three satellites in geosynchronous orbit and is to be supplemented in 1982 by a fourth satellite with twice the capacity of any of the current three.

At the same time, Fairchild Industries, parent company of American Satellite, and Continental Telephone Corporation, entered into an agreement with Western Union under which each would obtain 25 percent ownership in the business of that company's subsidiary—Western Union Space Communications, Inc. (Spacecom).

Spacecom is under contract to provide NASA's Tracking and Data Relay Satellite System (TDRSS) for a planned launch in the early 1980's. American Satellite will have the right to utilize half of the commercial capacity provided by TDRSS. When TDRSS is fully operational, total Westar capacity will include more than 36 C-Band transponders and K-Band capacity equivalent to approximately 12 more transponders.

General Services

Most of American Satellite's customers are served by private line voice and data circuits provided by General Services facilities. These customers are leasing from American Satellite circuits that can be used 24 hours a day for telephone conversations or transmittal of data at speeds up to 9,600 bit per second.

The user can talk person-to-person, computer-to-computer, or send data and other information simultaneously over traditional terrestrial lines connected to one of American Satellite's regional earth stations, which provides the link to the satellite.

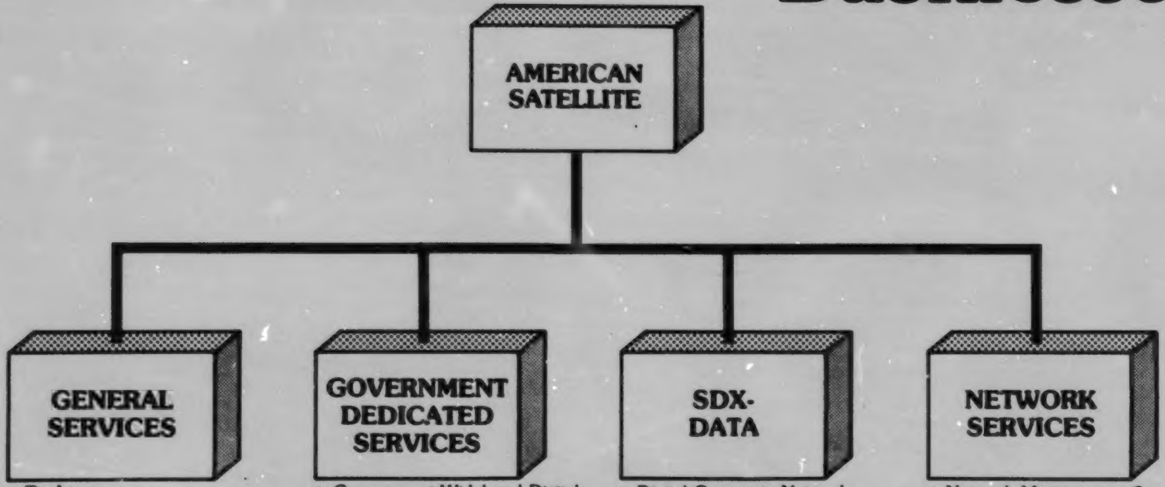
ASC provides general commercial services to 27 city pairs via a network of earth stations, microwave links, and central offices located in major metropolitan areas. Approximately 150 different customers, some using more than 100 circuits, are taking advantage of the economic and operational advantages of satellite communications.

A typical interconnect arrangement for a General Services customer is illustrated in Figure 2.

Customer-Dedicated Services

American Satellite Corporation pioneered in the introduction of wideband digital transmission via domestic satellite in the United States. This was accomplished by designing and placing in operation dedicated networks employing smaller, less expensive earth

Family Tree Of Businesses


AMERICAN SATELLITE
GENERAL SERVICES
GOVERNMENT DEDICATED SERVICES
SDX-DATA
NETWORK SERVICES

GENERAL SERVICES

- Tie Lines
- Interswitch
- Foreign Exchange
  - — Voice
  - — Voice Data
  - — Data (Up to 56 Kbps)
  - — Audio

GOVERNMENT DEDICATED SERVICES

- Government Wideband Digital
- Multiplex Secure Voice
- Mission Support
  - — Acoustical Research
  - — Strategic Meteorological
  - — Space Shuttle

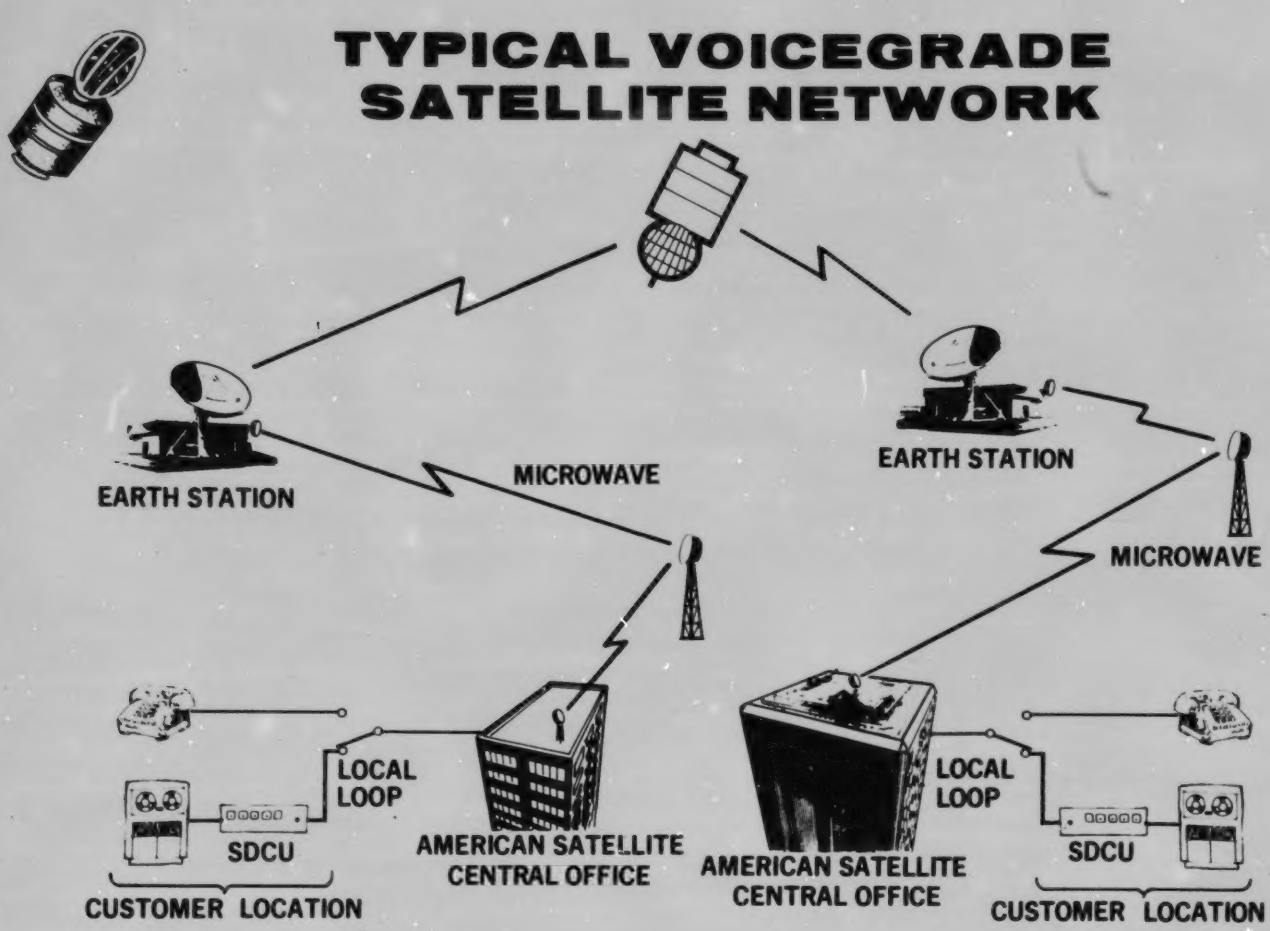
SDX-DATA

- Digital Corporate Networks
- Satellite Data Exchange Systems
- Distributed Processing Systems

NETWORK SERVICES

- Network Management Services
- SDX-Voice
- MetroLine Data Services (MDS)
- Concentrator Services
- Value Added Services

Figure 1



TYPICAL VOICEGRADE SATELLITE NETWORK

EARTH STATION
MICROWAVE
EARTH STATION
MICROWAVE
LOCAL LOOP
SDCU
CUSTOMER LOCATION
AMERICAN SATELLITE CENTRAL OFFICE
AMERICAN SATELLITE CENTRAL OFFICE
LOCAL LOOP
SDCU
CUSTOMER LOCATION

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Figure 2

terminals located on the customer's premises. The service is generally for the customer's exclusive use and requires no other terrestrial connection.

The first such service was established in the fall of 1974 for the Department of Defense. The first commercial networks of this type were installed by American Satellite and put into operation in August 1978. A total of 51 earth stations are now operational or under contract and are providing end users with a mix of services ranging from individual voice-type facilities to bandwidths in excess of three megabits.

The most dramatic example of efficiency in satellite communications has been obtained in the transmission of high-speed digital data, particularly at rates in excess of 56 kilobits per second (56,000 bits per second). American Satellite has become the major carrier among domestic satellite firms in providing customers with services operating with multiple 1.3 to 1.544 megabits per second data links on a point-to-point as well as multipoint basis.

A dedicated network supporting weather satellite operations for the Department of Defense is shown in Figure 3.

Satellite Data Exchange (SDX®) Service

The early experience in government contracts led to the development of Satellite Data Exchange (SDX) service, a modular, compact earth station designed to service a variety of applications. One of the first transportable SDX five-meter stations, displayed at the International Communications Association convention (ICA) in Los Vegas, helped in securing a number of awards in 1978. SDX communications systems are being used by such industries leaders as Sperry Univac, Boeing Computer Services, and Western Bancorp. Contracts for SDX have also been signed by Texas Instruments, General Dynamics, and Metropolitan Life.

Since a satellite is no more than a simple relay station in space, the advances characterizing satellite communications today result from improvements in earth terminals and associated equipment. It is here that American Satellite is concentrating on simpler, more efficient, and less costly systems. For example, American Satellite's dedicated networks initially used earth stations with 10-meter diameter antennas. The stations now being employed in the company's Satellite Data Exchange (SDX) service use the smaller 5-meter antennas. The versatility of this service is evidenced by the installation of an SDX earth terminal on top of the First National Bank Building in downtown Portland, Oregon, for use in the Western Bancorp Data Processing Corp. The rooftop installation and network are shown in Figures 4 and 5, respectively.

Data Transfer Efficiency and Security Equipment

An important equipment development is a proprietary device called the Satellite Delay Compensation Unit (SDCU) which virtually eliminates the effect of signal transmission delay in satellite communications, thus at lease doubling the normal efficiency of computer-to-computer data relay via satellite. This device also can increase the data transfer efficiency (transfer speed) of conventional ground-based communications links. The efficiency improvement is illustrated in Figure 6.

To ensure communications privacy, an important consideration in the transmission of financial data, American Satellite is offering an encryption unit called the Cryptoline^{SM}. This equipment can handle various data formats in a direct computer-to-computer interface over a satellite link. The CryptoLine security system is based on the data encryption algorithm which has been published by the National Bureau of Standards. This equipment can also provide transmission privacy to other forms of communications such as digitized voice, facsimile, and digitized video.

A Digital Communications Controller, another American Satellite development, allows the users of on-premises SDX earth station networks to simultaneously transmit voice, data, facsimile and even freeze-frame "snapshots" of persons or objects over a single digital channel. Contained in a cabinet roughly the size of a small refrigerator, this equipment contains, depending on user needs, a voice digitizer and data multiplexer, the Satellite Delay Compensation Unit, the CryptoLine data encoding and decoding equipment, and a private automatic exchange. The equipment enclosure is shown in Figure 7 with typical service arrangements.

Typical Customers and Users

American Satellite provides high-speed data transmission services by operating government-dedicated networks for the Air Force Defense Meteorological Satellite Program, Advanced Research Projects Agency, National Aeronautics and Space Administration (NASA) Space Shuttle Support Program, and a Department of Defense Bulk-Encrypted Voice Network.

To serve international customers, American Satellite has built two earth stations for Western Union International to provide service to the NASA Space Shuttle Program. The stations are located adjacent to existing stations in Etam, West Virginia, and Andover, Maine, to gain access to the INTELSAT network. The first ASC commercial

Defense Meteorological Satellite Program

Wideband Digital Communications Network

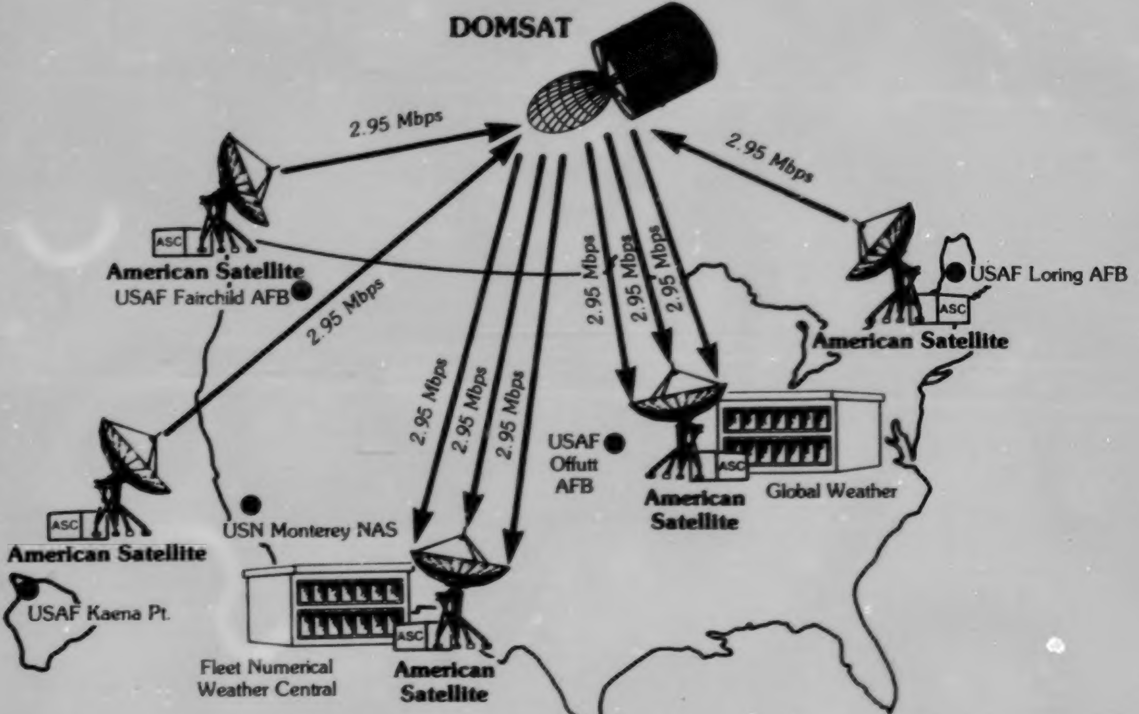
DOMSAT
2.95 Mbps
2.95 Mbps
2.95 Mbps
2.95 Mbps
2.95 Mbps
2.95 Mbps
2.95 Mbps
2.95 Mbps
2.95 Mbps
ASC
American Satellite
USAF Fairchild AFB
USAF Loring AFB
ASC
American Satellite
USAF Offutt AFB
ASC
American Satellite
Global Weather
ASC
American Satellite
USN Monterey NAS
USAF Kaena Pt.
Fleet Numerical Weather Central
ASC
American Satellite

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Figure 3

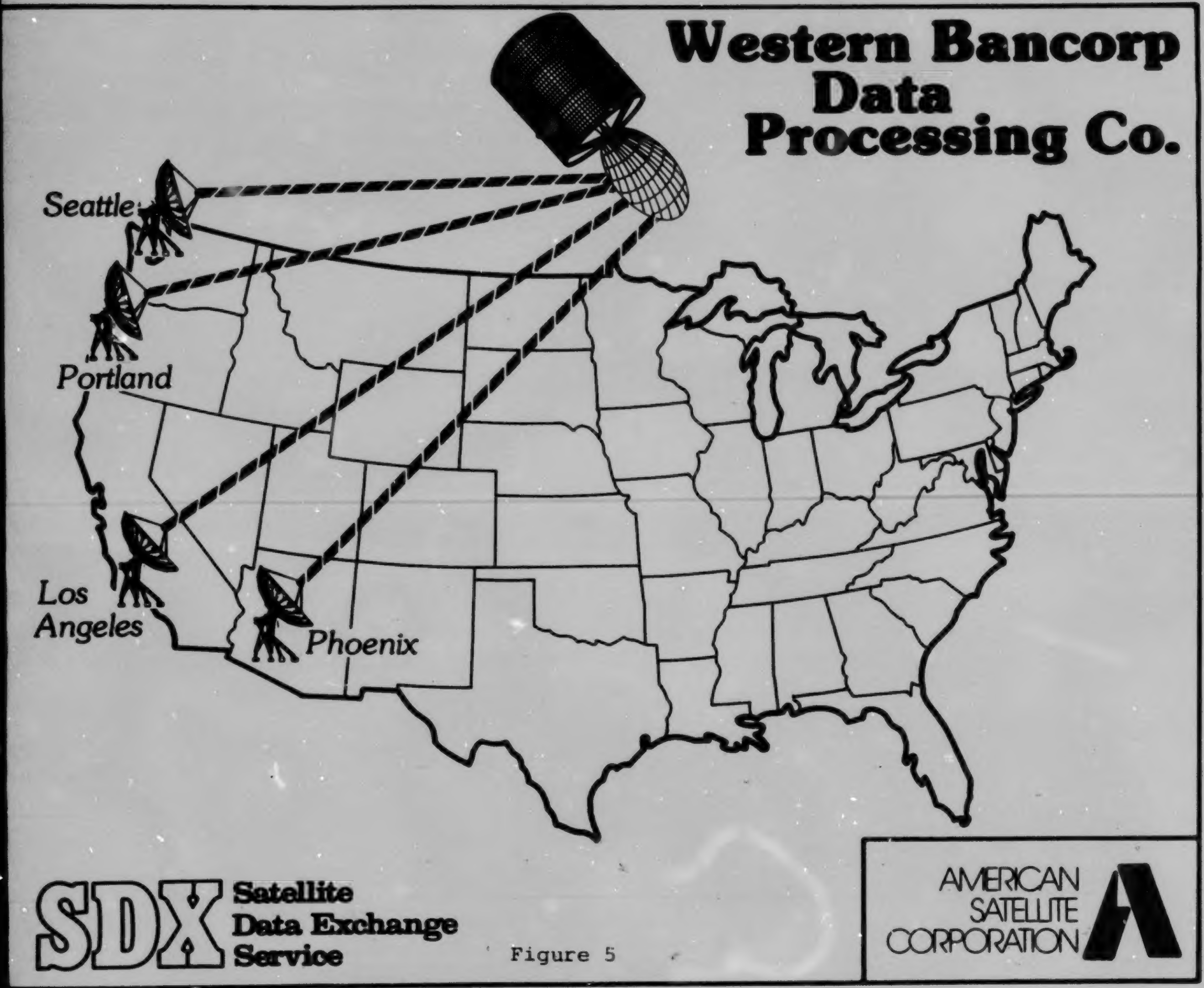
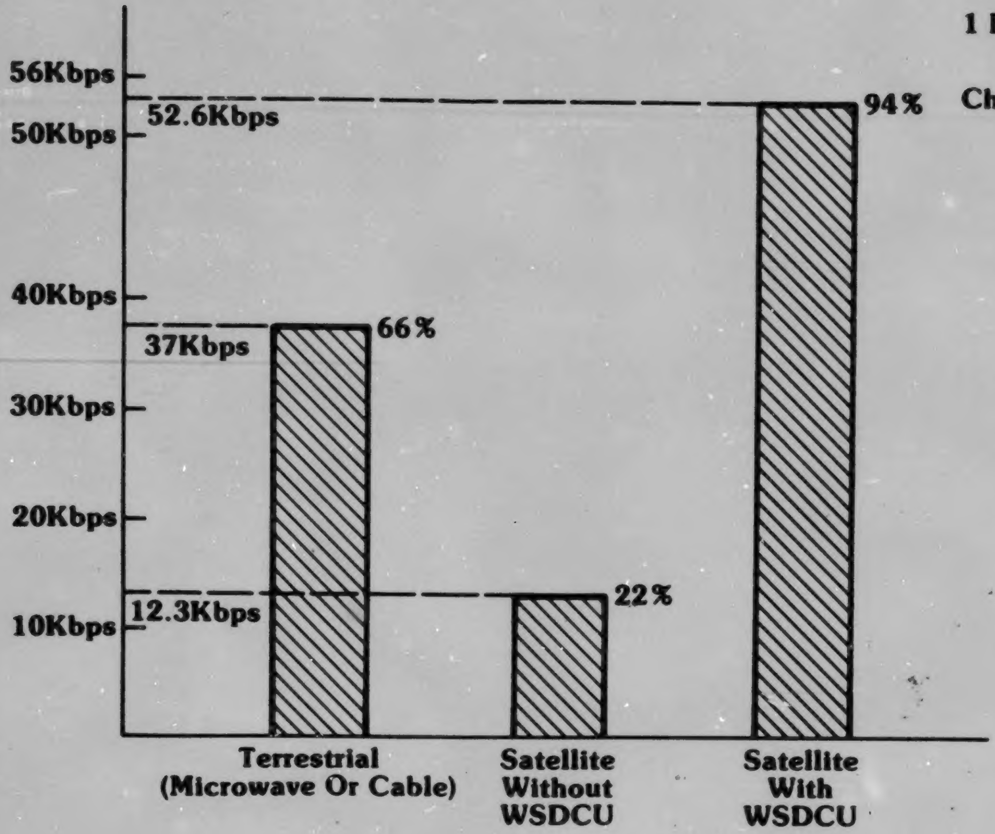

Western Bancorp Data Processing Co.
Seattle
Portland
Los Angeles
Phoenix
SDX Satellite Data Exchange Service
AMERICAN SATELLITE CORPORATION

Figure 5

Impact of WSDCU 56Kbps Channel



Block Size = 1000 BYTES

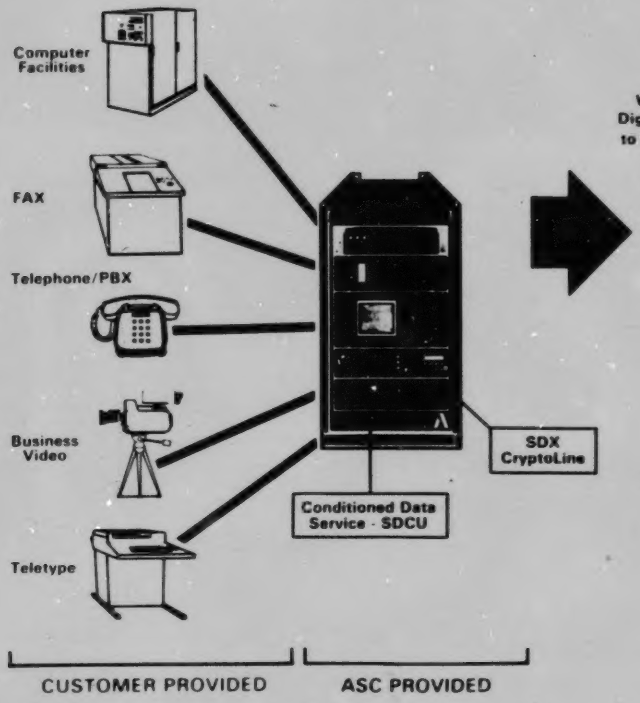
1 BYTE = 1 Character
= 8 BITS

Channel Error = 1×10^{-6}

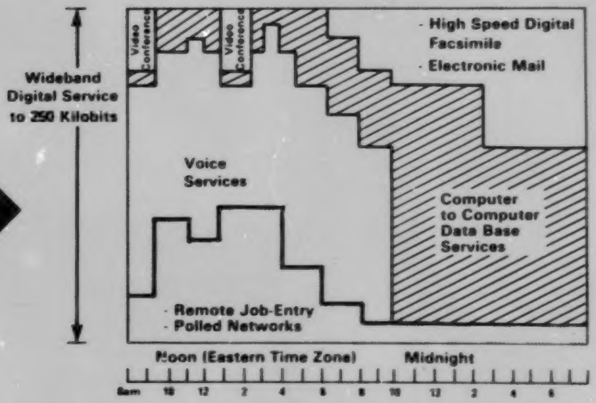
Figure 6

SDX® DIGITAL COMMUNICATIONS CONTROLLER

DIGITAL CONTROLLER


Computer Facilities
FAX
Telephone/PBX
Business Video
Teletype
SDX CryptoLine
Conditioned Data Service - SDCU
CUSTOMER PROVIDED
ASC PROVIDED

TYPICAL SDX NETWORK APPLICATIONS



Customer Control — On-Line Assignment Of Service Mix

- Multiple Uses of One Digital Satellite Channel
  - Digitized Voice
  - Facsimile
  - Computer Data
- User Can Change the Mix of Communications Services to Meet His Requirements

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Figure 7

contract for service to Etam was received from Texas Instruments for double-hop international service between Dallas and London.

American Satellite customers, in addition to SDX® service subscribers listed earlier, include many of the nation's largest business firms such as Shell Oil, Bank of America, IBM, E. F. Hutton, Warner Communications, Exxon, the Southland Corporation, Lockheed, Pan American, Bechtel, Transamerica, Chase Manhattan Bank, and CBS. A listing of the operational Earth Stations and Central Offices is provided in Table 1, and a network map is shown on Figure 8.

Customers report substantial savings compared with land-based circuits. Communications with American Satellite are of higher quality because one satellite repeater takes the place of hundreds of telephone facilities, switches and signal boosters normally used to relay messages over long-distance terrestrial lines.

Communications signals are combined, or multiplexed, by the central offices into groups of circuits for transmission, usually by microwave, to an earth station, then sent to a satellite. Signals are also received by the central offices and distributed to the user.

Each central office consists of transmission and switching equipment, high-speed data modems, echo suppressors, echo cancellers, traffic analysis equipment, and emergency power sources in case of commercial failures.

Table 1
Locations of Earth Stations and Central Offices

Major Commercial Earth Stations		Operations Began
Dallas, TX		1974
Los Angeles, CA		1974
New York, NY		1974
San Francisco, CA		1976
Dedicated Earth Stations for Business		
Chicopee, MA*	Dow Jones & Company	1975
Orlando, FL*	Dow Jones & Company	1975
South Brunswick, NJ*	Dow Jones & Company	1976
Blue Bell, PA	Sperry Univac	1978
Roseville, MN	Sperry Univac	1978
Philadelphia, PA	Boeing Computer Services	1978
Seattle, WA	Boeing Computer Services	1978
Wichita, KS	Boeing Computer Services	1978
Seattle, WA	Western Bancorp	1979
Portland, OR	Western Bancorp	1979
Los Angeles, CA	Western Bancorp	1979
Phoenix, AZ	Western Bancorp	1979
Vienna, VA	Boeing Computer Services	1979
Salt Lake City, UT	Sperry Univac	1979
Norwich, CT	General Dynamics	1979
San Diego, CA	General Dynamics	1979
		Scheduled
Fort Worth, TX	General Dynamics	1980
Sanford, FL	General Dynamics	1980
Dallas, TX	Texas Instruments	1980
Wichita, KS	Metropolitan Life	1980
Scranton, PA	Metropolitan Life	1980
Greenville, SC	Metropolitan Life	1980
Dedicated Earth Stations for Government		**Operations Began**
Fairchild Air Force Base, WA		1974
Loring Air Force Base, ME		1974
Offutt Air Force Base, NE		1974
Centerville Beach Naval Station, CA		1975
Moffett Naval Station, CA		1975
Monterey Naval Station, CA		1976

* Designed and installed for Dow Jones & Company (The Wall Street Journal).

(Continued)

Table 1
Locations of Earth Stations and Central Offices
(continued)

Dedicated Earth Stations for Government (continued)	Operations Began
Barbers Point, HI	1977
Stockton, CA	1977
Wahiawa, HI (For WUI Service to Government)	1977
Kennedy Space Center, FL	1978
Goddard Space Flight Center, MD	1978
Andover, ME (For WUI Service to Government)	1979
Etam, WV (For WUI Service to Government)	1979
Kaena Point, HI	1979
Downey, CA	1979
Point Sur, CA	1979
Johnson Space Center, TX	1979
Nellis AFB, NV	1980
Hill AFB, UT	1980
Tula Peak, NM	1989
Vandenberg AFB, CA	1980
Marshall Space Flight Center, AL	1980
Seal Beach, CA	1980

Central Offices

Strategically located in metropolitan areas to provide an essential communications link between a user's facilities and an earth station, central offices have been established in:

Los Angeles
San Francisco, CA
Chicago, IL
New York, NY
Houston, TX
Washington, DC
Dallas, TX

Satellite Communications Network

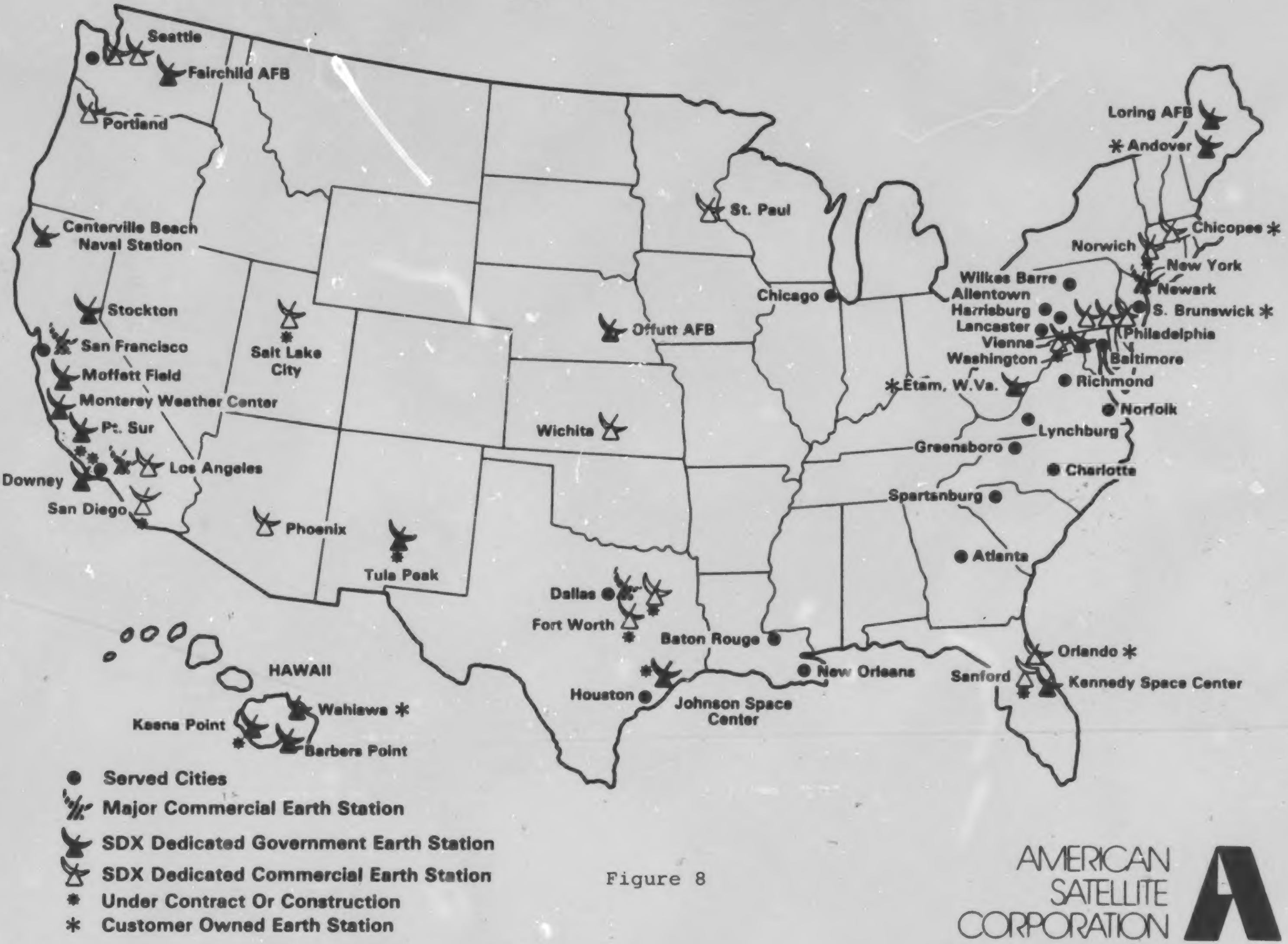
Seattle
Fairchild AFB
Portland
Centerville Beach Naval Station
Stockton
San Francisco
Moffett Field
Monterey Weather Center
Pt. Sur
Los Angeles
Downey
San Diego
Salt Lake City
Phoenix
Tula Peak
St. Paul
Offutt AFB
Wichita
Dallas
Fort Worth
Houston
Johnson Space Center
Baton Rouge
New Orleans
Chicago
Etam, W.Va.
Loring AFB
Andover
Chicopee
Norwich
New York
Newark
S. Brunswick
Wilkes Barre
Allentown
Harrisburg
Lancaster
Vienna
Washington
Philadelphia
Baltimore
Richmond
Norfolk
Lynchburg
Greensboro
Charlotte
Spartanburg
Atlanta
Orlando
Sanford
Kennedy Space Center
HAWAII
Wahiawa
Kaena Point
Barbers Point
Served Cities
Major Commercial Earth Station
SDX Dedicated Government Earth Station
SDX Dedicated Commercial Earth Station
Under Contract Or Construction
Customer Owned Earth Station

Figure 8

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CORPORATION

IMPLEMENTING TELECONFERENCING IN AN INDUSTRY

John F. Malone
President
The Eastern Management Group
Morris Plains, New Jersey

Introduction

The recent growth in teleconferencing products and services has resulted in an increase in the quantity of information available to businesses on the types of meetings most adaptable to the Media. With little effort, any company can learn such things as performance appraisals are less suited to teleconferencing than information exchange meetings.

Despite the volume of teleconferencing intelligence being generated today, very little is sufficiently usable to enable businesses to make prudent decisions regarding where and how to implement teleconferencing. It is the objective of this paper to begin to free this word.

In the business community, companies are divided into two primary classifications: industrial concerns and service businesses. Beginning with the latter first, an evaluation of the member enterprises will unearth businesses such as banks, brokerages, real estate firms, utilities, associations, personal services, professional services, ad information. The list is lengthy, as any perusal of a S.I.C. directory will highlight. Within each of these types of businesses, communications flows are witnessed in great volume. In fact, the nature of these firms is such that they are frequently classified as communications intensive.

Because of the large volume of information relayed from person to person in the service industry, it is an excellent candidate for electronic media which can enhance the speed, quality and quantity of information movement. Needless to say, every service industry classification is replete with teleconferencing applications.

The service sector of the economy functions quite differently from its industrial counterpart. The information flows are different, as are the business systems and functions. To address teleconferencing applications within the service sector exceeds the bounds of what is feasable within the confines of this paper: that is to say, if adequate attention is to be paid to the industrial side of the economy, such an analysis does, however, form the foundation of additional research now being performed by The Eastern Management Group. Suffice it to say, however, that because of the difference in communications flows between each of these two sectors, an indication of how to proceed with the implementation of teleconferencing in one is not sufficiently to orchestrate a similar process within the other segment.

In defining the term industry, what is true with the commercial sector is equally true for this entity in terms of company types. There are many! To alleviate confusion early on, industrial concerns produce and sell durable and/or non durable goods. Participating business waved therefore include automobile manufacturers, machine companies, construction firms, as well as businesses involved in the forestry, aerospace, electronics, rubber, minerals and consumer products industries, to name a few. Implementing teleconferencing within these types of firms is the thrust of this report.

Where to Begin

Within the industrial organization, the initial interest in teleconferencing generally begins in one of two places: either at the most senior levels of corporate management (i.e., V.P. Strategic Planning, V.P. Finance) or within the ranks of middle management. When interest is spawned from these middle managers, the two groups most frequently responsible for initiating the activity are communications and data processing managers.

The reasons for finding such a localization of idea generation are simplistic and understandable. Senior management is charged with responsibility to improve corporate profits. Their thinking is financially oriented. Anything that can favorably impact profits is of interest, and teleconferencing is occasionally perceived as being able to meet this need. How? By doing things such as reducing travel expense; by getting meetings off the ground more rapidly; by enabling more executive talent to attend meetings, thereby enhancing the likelihood of making more prudent decisions. These motives and many more, are financially driven, and account for why senior management is one of the groups frequently associated with stimulating company interest in teleconferencing.

The communications or data processing manager oftentimes is motivated to evaluate teleconferencing for a very different set of reasons.

Both the communications manager and data processing manager are on the leading edge of technology. They are the first to learn of electronic developments which can benefit their organization. And, although not charged with direct accountability for the profitability of the business, they do share an understanding of the needs of the business and do comprehend the benefits associated with much of today's new technology.

Team Building

Regardless of where the idea for teleconferencing originated, it is important to note that if the effort is to be fruitful, the business needs to first build a team that will be accountable for the effort. The team players should consist of one senior level management person and the communications or data processing manager as a minimum. For best results a task force should be organized consisting of these two individuals, plus one other from each of the corporate systems (to be discussed later).

Because the senior team member will be making decisions which effect every corporate function, the most suited individual would be one who has an insight into each. Good senior team members are often the Executive Vice President, Vice President Finance, Vice President Long Range or Strategic Planning, or the Controller. Once the team has been assembled, the company is ready to proceed to the analysis phase.

The Analysis

Since it is the corporate communications flows that will ultimately migrate from their present mode to teleconferencing, it is important to recognize what communications flows exist within the company. This is the subject of this section.

Industrial concerns are comprised of employees who are assigned to a specific unit of the company. These units are called functions. In the industrial company, the primary business units are manufacturing, marketing, finance, accounting, purchasing and personnel.

Within the same company, employees from each function are assigned a series of tasks which must be performed to ensure that the company operates efficiently. These tasks, coupled with related tasks from employees in other corporate functions constitute the basic elements by which the company operates. These operational elements are called Systems. J. W. Haslett, a management consultant, once explained the process by indicating that a system "is the aggregate of the procedures, processes, and tasks relating to a particular company activity such as the Manufacturing System".[1]

The primary corporate systems are the manufacturing system, the marketing and distribution system, the purchasing and materials handling system, the account payable and receivable system, the personnel, payroll and benefits system and the general management system.

When a system is functioning within a company, a situation never exists whereby the employees of one function operate the entire system alone. There are always at least two functions which participate in executing a system. In fact, the general management system requires effort on behalf of employees from each of the six corporate functions for it to operate efficiently.

Because systems rely upon a number of functional interactions to operate, there are occasionally problems. Conflicting functional objectives, conflicting functional objective interpretations, even personalities can cause systems to operate at less than desirable performance. And when systems do not operate to specification, problems can be difficult to remedy, since systems do not have management hierarches as do functions.

The most basic element common to the functioning of a system is the communication flow. If the system is to be fine tuned to perform at a more desirable level, the communication flow must not be jeopardized in the least. Ideally, the communication flow will be enhanced. Therefore, before proceeding further, let us begin by looking at those functions which participate in performing the activities of each system. These are the various groups which will be communicating as the system operates.

Manufacturing System
- Manufacturing function
- Marketing function
- Accounting function
- Purchasing function

Marketing System
- Marketing function
- Finance function
- Accounting function
- Purchasing function

Purchasing System
- Manufacturing function
- Accounting function
- Purchasing function

Accounts Payable and Receivable System
- Finance function
- Accounting function

Personnel, Payroll and Benefits System
- Finance function
- Accounting function
- Personnel function

General Management System
- Manufacturing function
- Marketing function
- Finance function
- Accounting function
- Purchasing function
- Personnel function

KEY FUNCTIONAL SYSTEMS	KEY COMPANY FUNCTIONS					
	V.P. Manufacturing	V.P. Marketing & Distribution	Finance	Accountant	V.P. Purchasing & Materials Planning	V.P. Peronnel & Benefits
Manufacturing System	X	X		X	X	
Marketing & Distribution System		X	X	X	X	
Purchasing & Materials Handling System	X			X	X	
Accounts Payable & Receivable System			X	X		
Personnel, Payroll & Benefits System			X	X		X
General Management System	X	X	X	X	X	X

Functional Versus System Analysis

When identifying where to begin the teleconferencing implementation process, the question frequently arises "Should the process be implemented horizontally or vertically?" In actuality, the answer is both, but greater emphasis is placed on identifying the system to concentrate on. The logic behind this is easy to follow.

Within the company, it is the efficient operation of the system which has the greatest influence on whether or not the company generates a profit. If a system is not operating at a tolerable level, the end product of the system is effected. This situation is easily recognizable by the company's senior management. It also generally causes the company to make a concerted effort to remedy any difficulty. The more critical the system, that is to say the more closely it relates to profits, the greater the emphasis is placed on clearing up problems.

As was noted before, it is the functions which are responsible for the proper execution of a system. Therefore, in selecting where to begin the teleconferencing implementation process, the functions can not be ignored. But we also know that within each function there are communications flows which appear extraneous to the operation of a queen system. Oftentimes we hear that this is probably the easiest place to begin implementing teleconferencing. In practice, this is wrong. When functional communications are migrated to teleconferencing without being driven by the need to improve the operation of a system, the effort is generally a failure. To understand the reasoning behind this, we must recall the driving force behind all companies.

If the result of an action does not have a visable line through to an improvement in corporate profitability, the corporate commitment is generally lacking. Once commitment falters, so does the effort. Therefore, if the impact of the action, in this case converting to teleconferencing, is not clearly visable on the company's bottom line, the chances for success are grim.

Now let us take this point one step further. If a system is functioning efficiently, the company is inherently less driven to altar operations than if the system is operating with some difficulty. Tampering with success, especially when the alternative carries with it some risk, as does teleconferencing, is perceived as a chance that most companies cannot or will not take.

Now that we know that the system selected for teleconferencing is better if it is in a state of flux, let's return to our system function grid.

As you will note just from examining the system/functional interaction, some systems appear much more complex in operation than others. As you will note when later analyzing communication flows, the Manufacturing, Marketing and Distribution and General Management System are more complex than are the others. Because of the large number of functions which must interrelate and interact with each other for these systems to perform efficiently, there is a great potential for difficulty to exist within each system. And as was noted earlier, malfunctioning or inefficiently functioning systems are the best one to select if a change is to be introduced into the company.

Now that we have narrowed the teleconferencing implementation process to three alternative systems, we will proceed with an analysis of each to determine where to begin.

The Manufacturing System not only depends heavily upon interfunctional communication, it requires an even greater volume of intrafunctional communication. Therefore, we find both horizontal and vertical teleconferencing applications.

The marketing system is considerably more reliant upon interfunctional communications to perform efficiently than it is on intrafunctional exchanges. In fact, in the latter category, most of the intrafunctional exchanges are reported manager exchanges, where both or all individuals are generally co-located.

The general management system can be considered the intelligence of the organization. Each functional entity passes information, most often computerized, to the senior management ranks of the function. This information is then interpreted and exchanged with senior members of other functions. The sum of these interactions or information exchanges results efficient operation of the company -- a status no company ever seems satisfied with.

From these three systems the target for teleconferencing is best narrowed down to the Manufacturing system and the General Management system. Either one makes an excellent place to begin to implement teleconferencing. We will, however, take a look at both, and present a case for beginning with mechanizing the general management system.

The General Management System

As most people charged with implementing teleconferencing are painfully aware, many companies that have attempted to implement this media have failed miserably in the effort. In fact some of the worst disasters are credited to businesses that sell teleconferencing products. The reasons by now should be clear. Too little planning for the task, selecting functional targets without regard to system targets, the list could go on indefinately. Because of all the failures, it is important to do all that can be done to ensure success. It is our perception that applying teleconferencing to the general management system offers a very good route to success. The reasons are as follows.

Companies are inherently never satisfied with the return on shareholders equity. If they would be, the stockholders would not. Therefore, the need for improvement is inherent to the organization and never ending. Since it is the general management system which is responsible for running the business, this systems appetite for improvement is insatiable within every industrial organization. And, as we have seen earlier, this requirement must be in evidence before any system can be successfully migrated to teleconferencing.

Now let us evaluate exactly what it is that is found in the general management system that can be improved by teleconferencing. To do this, one must disect the general management system. By doing so, it is first noted that the participants in this system are the heads of each corporate function. Generally they are vice presidential level. Armed with information about how their function is operating and its capabilities and limitations, each functional head exchange information with the other functional heads. This information exchange, brought to life by the personal management interchanges between executives, is what accounts for the way the business operates. It is generally perceived that the more effectively these individuals interact, the better the overall company will perform. Unfortunately, these officers are generally spread too thin, and are not at one anothers disposal as often as they or the company would like. For this reason, and many more as we shall see, the general management system is a good one to benefit from teleconferencing. It can get people together more regularly.

With a general management teleconferencing system, executives are more accessible to one another, and in a better position to exchange information which will result in better management of the business.

Additionally, if top management has an opportunity to see the benefits of teleconferencing, it is significantly easier to overcome many of the "sociological" problems blamed on the medium (i.e., a perceived eduction in travel perks to middle and lower managers), which must be expected when other systems convert to teleconferencing.

Another benefit of initiating teleconferencing implementation with the general management system is that the company can minimize many of the risks often associated with teleconferencing. For example, one type of conference such as the quarterly Vice President meeting can be converted to a teleconference, utilizing rented equipment. Activities such as this can save the company the large start up cost frequently perceived as accompanying teleconferencing.

The Manufacturing System

Depending on the circumstances surrounding the task of implementing teleconferencing, it may be felt that the general management system is best left undisturbed. If this is the case, the manufacturing system is the next best place to start.

As we discussed earlier, the odds of successfully converting to teleconferencing in a smoothly running system are far worse than if the system is faced with problems. Because the manufacturing system requires so much interfunctional and intrafunctional communication, there is a good likelihood that its performance is below par.

When evaluating the manufacturing system the first decision which must be made is where to begin. Since the manufacturing system will be introduced to the medium in stages (as is true with each of the subsequent systems), the task at hand is to narrow down the communication link as much as possible. To begin, and this holds true for every system, the initial target communication exchanges should be intrafunctional. Since there is no interfunctional management at this level of the organization, there would be a greater chance of having an absence of management commitment to the effort. Therefore, intrafunctional exchanges make better targets.

Selecting the function is also easy. In every system, with the exception of the general management system, one function bears either explicit or implied accountability for the performance of the function. This is true even though the functional head is incapable of enforcing direct authority over cooperative functions.

Manufacturing System - Manufacturing Function

Marketing & Distribution System - Marketing Function

Purchasing & Materials Handling System - Purchasing Function

Finance System - Finance Function

Accountant System - Accountant Function

Personnel & Benefits System - Personnel Function

Functional Accountability for Systems

As can be seen from the chart, it is the manufacturing function which is held primarily accountable for the operation of the manufacturing system. It is, therefore, most likely to be receptive toward remedying difficulties. Therefore, the greatest opportunity for success will be to introduce teleconferencing into the manufacturing function.

Identifying where in the manufacturing function to start is a complex task. Since teleconferencing is a communication alternative, the existing modes of communications within the function must be identified. It is best to use the entire teleconferencing task force to analyze all the communication flows in which the manufacturing function impacts the manufacturing system. It should be noted that what the team is looking for are communication problems, lack of communication problems, problems caused by the timing of communications, and logistical problems.

To help the readers understand how this process might work, let us look at the manufacturing function components involved in operating this system and then an in depth look into the communication requirements of just one component.

The components are production engineering, process engineering, materials control, labor control, quality assurance, plant maintenance engineering, materials stores, shop stores and plant work locations. Selecting quality assurance for more in depth analysis, we find the following types of communications.

To begin with, corporate (functional) management communicates with quality assurance about profitability goals, and receives back communications concerning quality costs and benefit analysis. Marketing and sales relay customer complaints and receives product quality reports. Quality assurance will issue requests to tool engineering for quality control tools and will get back designs. Communications with product design consists of bills of material in one direction, then reports on the suitability of materials, in the other direction. In communicating with materials control, quality assurance issues inspection reports and gets back corrective action reports. And between quality assurance and manufacturing production, there are quality standards and procedures in one direction, and data on the quality of production output in the opposite direction.

Now this is a very simplified list of communications flows within just one element of the manufacturing function. To be authentic, however, the same types of communications flows must be identified for all the manufacturing function components. While this is being done, problems will begin to rise to the surface; problems which could be resolved by teleconferencing.

After all of the manufacturing intrafunction communications have been identified with their corresponding problems and teleconferencing solutions, costs can be computed.

As teleconferencing is introduced into the manufacturing function, costs should distate what direction is pursued. If the dollar value received from a teleconferencing solution does not exceed the cost, the idea should be abandoned. Once costs are computed in relation to the dollar value of the solution, expenditures can be prioritized. This would be the process by which the manufacturing function is introduced to teleconferencing.

The actual implementation process must be phased. First one type of interchange is mechanized (i.e., quality assurance and product design), and after success, then another.

Once the intrafunctional communications for manufacturing benefits from the implementation of a desirable level of teleconferencing, intrafunction communications can be evaluated for each of the other functions participating in the manufacturing system, to the extent of their involvement. The process is iterative of that just discussed.

After each of the functions participating in the manufacturing system have integrated a desirable level of teleconferencing into their operations, a decision must be made. Should interfunctional communications in the manufacturing system be subjected to teleconferencing? If the task force has any doubt at this stage as to what the result of such an effort would be, it is best to select another target system.

Once the general management system and manufacturing system have been introduced to teleconferencing, the company should be well on its way to improved system operations. At this point, it should also be plain for the task force to see which additional corporate systems should be analyzed. Of course from time to time identifying a course of action is less than clear cut, and some general rules must be referred to. If this be the case, the task force should then move on to the marketing system, followed by the purchasing system (including materials handling), the accounts payable and receivable system, and then the personnel, payroll and benefits system, in that order.

In summary, it should be noted that once the groundwork for analyzing the applications for teleconferencing has been laid, much of the remainder of the task is repetitive in nature. By bearing in mind that the company is financially driven, and motivated to act only by problems that have a financial penalty, one is well on the way to insuring that their company's experience with teleconferencing will be a rewarding one.

[1] Haslett, Business Systems Handbook, McGraw Hill, 1979

CONDUCTING BUSINESS MEETINGS BY TELECONFERENCE

Susan G. Pereyra
Director
The Darome Connection
Danbury, Connecticut

Now that escalating costs are rendering business meetings that require travel obsolete and inefficient, the teleconference has become the better, faster and more flexible method of business communication. There is an added dividend to teleconferencing: the quality of information exchange on a telephone conference is often better than in a face to face meeting because participants on a conference feel less exposed and tend to be more candid and open with their comments and opinions. Therefore, teleconferencing is not just a substitute for in-person meetings; it is, in many cases, a new and better way to conduct business.

Despite the advantages of teleconferencing, the fact remains that it is an entirely new experience for most of us. And, as with anything new, teleconferencing requires extra effort and time before we can gain familiarity and comfort with this new medium.

The purpose of this paper is to help make the transition easier for those who are planning to conduct meetings by teleconference for the first time.

As Director of the Darome Connection, the telephone conferencing service provided by Darome, Inc., I have conducted countless meetings by teleconference. In the process, I have developed a method of my own that has worked well for me and has proved simple and flexible. In fact, I never moderate a teleconference --no matter how hastily put together -- in which I do not go through the steps outlined here.

My method is, by no means, the only way to organize and conduct a meeting by teleconference. However, it does provide for what I think is the absolute rule for the most effective use of audio teleconferencing: that is, to hold attention for more than five minutes at a time, it is necessary to vary presentation style, to have a change of speakers, or best of all, to have active participation and interaction on the part of the group.

The moderator cannot rely on visual clues such as eye contact for assurance that he has been understood. Instead, he periodically polls the group for comment and response. Likewise, participants on a conference have no visual diversions to hold their attention. They will remain most attentive if they know they'll be asked to participate or contribute to the teleconference in some way.

These factors are built into my method for conducting a teleconference meeting. My objective is to provide a versatile and workable model which anyone can adapt for his own purposes while remaining confident that he is using the medium effectively.

My techniques are geared for the audio teleconference that has no visual supplements such as slides, video tapes or full motion video for support. However, there may be a written agenda or reference material in written form. The audio teleconference is the most flexible form of conferencing and requires the least amount of advanced preparation. It has the spontaneity and informality of in-person meetings called quickly for important information exchange.

The telephone is the only equipment required for this form of teleconference. Arrangements need to be made with the Darome Connection to connect all of the callers together. The telephone company also provides some conferencing capability with its conference call. Occasionally, some calling locations may have groups participate by means of a teleconference device attached to the telephone line. These include the Darome Convener, the Bell speaker phone or 50-A, or the Northern Telecom Conference 2000 unit.

Since my experience has largely been with teleconferences conducted through the Darome Connection, my methods are particularly suited to the interactive capability of the voice-activated Darome system. However, the steps outlined here work well even for face to face meetings.

I have found the secret to conducting an effective business meeting by teleconference is in the preparation. If I think through my objective carefully and analyze the path of communication flow and then select the structure and format for each portion of the meeting, there is very little to worry about while I am conducting the meeting. Once this process is reduced to a system, it can be done in a few minutes with some hasty notes when necessary.

Therefore, the secret to conducting a good meeting is good preparation. And the key to good preparation is developing an On-Line Agenda for the meeting. All of the following steps for conducting a teleconference are concerned with preparation - except the last. Most time is devoted to helping you prepare an On-Line Agenda.

The steps are listed below for easy reference, and the remainder of this paper discusses each one separately.

Reserve Conference Time

Notify Participants

What Is Your Purpose or Subject?

What Is Your Objective?

Develop an Agenda

Construct an On-Line Agenda

- Roll Call
- Welcome & Introductions
  (Announcements)
- State Purpose & Objective
- Review Agenda
- Item #1 (Select Interactive
- Item #2 or Broadcast
- Item #3 modules)
- Summary & Close of Meeting

Conducting the Meeting

RESERVE CONFERENCE TIME FOR YOUR MEETING

Make your telephone conference reservations with the Darome Connection by calling toll-free 800-243-0991 with the following information:

- Day and Date for the Meeting
- Time, Eastern, for the Meeting
- Estimated Duration of the Conference
- Number and Names of Participants

The Darome Connection will confirm your conference reservation by assigning a teleconference phone number for your meeting. Your participants should be given this special teleconference phone number when they are notified of the meeting. At the designated time, each participant calls into the conference from any telephone.

NOTIFY PARTICIPANTS

The following information should be given to each participant when you notify them of the telephone conference:

- Name of the Moderator (Person Conducting the Meeting)
- Day
- Date
- Time, Eastern, or in the Participant's Time Zone
- Teleconference Phone Number Issued by the Darome Connection

Optional:

- The Subject of the Conference
- The Agenda
- Preparation Required of Participant
- List of Participants
- Advance Material

Participants can be notified by telephone, by mail, mailgram or Telex.

If participants are unfamiliar with the procedure, give complete instructions.

WHAT IS YOUR PURPOSE OR SUBJECT?

What is your reason for calling this meeting?

It is important, for yourself particularly, to state the purpose of the meeting simply and concisely.

Carefully expressing your purpose in one sentence is the first step toward structuring an effective teleconference.

For example:

> "The purpose of this conference is to discuss the entry of a competing product ATAR into the marketplace."

If participants are given the purpose of the meeting when they are notified, their thinking will be more focused for the conference.

WHAT IS YOUR OBJECTIVE?

What do you want to accomplish with this meeting.... What is the end result you want to achieve?

The objective differs from the purpose of the meeting in that it is a precise expression of what you expect the meeting to produce.

For example:

> "The objective of this meeting is to A) assess the potential threat this new product ATAR is to our present share of the market, and B) to determine what immediate action should be take to counteract this threat."

How well you define the purpose and objective for the conference will determine how effectively you structure and conduct your meeting. These two items are essential to the most productive use of conference time.

DEVELOP AN AGENDA

To accomplish your objective, what items need to be covered in your meeting, and in what order? Develop your agenda.

For example:

" 1. Background and present knowledge of competing product ATAR - assess the threat

2. Suggested courses of action

3. Consensus on action to be taken immediately "

For an audio conference, with people on telephones and not a conference device, the maximum productive time for a meeting is between forty minutes and one hour. For this reason, it is important to limit your agenda to two or three items.

The danger in planning a teleconference is to attempt to accomplish too much in the time available. That is why the next step in preparation is the On-Line Agenda which outlines the structure of the meeting and allots realistic time segments to each agenda item.

CONSTRUCT AN ON-LINE AGENDA

The next step is to take your purpose, objective and agenda and to construct an On-Line Agenda that will be your blueprint for your teleconference meeting.

In constructing your On-Line Agenda, you will select an appropriate format or presentation style called an "agenda module" for each item you plan to cover in the meeting. Some presentation styles and meeting formats are better suited to the interactive nature of the teleconference medium than others. A few of these have been organized into agenda modules of approximately fifteen minutes each. They are presented here for you to use in constructing an On-Line Agenda for your own meeting. By using agenda modules you can be assured of conducting your meeting in an effective teleconference format.

The On-Line Agenda will quickly become an indispensable tool for planning and running a business meeting by telephone conference.

Following is a standard outline for an On-Line Agenda that works well for almost any type of business meeting by teleconference. It can be adapted easily to fit any objective, and agenda modules can be inserted at the appropriate places.

On-Line Agenda

	Roll Call (Usually performed by Darome Connection Operator)
:00	Welcome & Introductions (Moderator)
:01	State Purpose & Objective
:03	Review Agenda (Explain how you plan to proceed with the meeting)
:05	Item #1 on Agenda (Follow agenda module selected)
:20	Item #2 on Agenda (Follow agenda module selected)
:35	Item #3 on Agenda (Follow agenda module selected)
:50	Summary & Close of Meeting
:55	Conference Concluded

This standard format for the On-Line Agenda is classic in its simplicity and flexibility. There isn't any meeting or program - no matter how informal or sophisticated - that cannot be accommodated by this agenda.

To use this agenda well, however, requires an understanding of the principles of good teleconferencing techniques that lie behind each component. Following is an explanation of each section of the agenda, including a discussion of appropriate agenda modules to be used:

Roll Call

The roll call may appear to be one of the more inconsequential sections of the agenda. However, it is really one of the most important in setting the meeting off to a proper and comfortable start.

On a Darome Connection conference, the Darome operator performs this essential function by addressing the moderator first and then going "around the conference" calling each person's name and asking him to respond with the name of the city and state from which he is calling.

Remember, on an audio teleconference, the only way you really know who is "in the room" is by the sound of voices. Even with a participant list in front of you, you will feel "blind" if you haven't heard the voices of all participants during the roll call.

And--the participant who may not have been acknowledged during the roll call has the disquieting feeling that he does not exist in the awareness of the group. Indeed, he does not because no one has heard his voice. If he does decide to speak during the meeting, he gives the group a jolt as if he were an intruder or an unknown eavesdropper.

Of course, there are times when a conference is so large that a roll call is out of the question. When a conference consists of a group of people at each calling location, the roll call may require a group leader at each site to respond instead of each individual.

A group has to become a group before it can be productive or creative. The roll call has this as its function. It takes the place of the handshake in a face to face meeting.

Welcome & Introductions

When a roll call is impossible, the welcome and introduction section serves as the main "humanizing" element of the conference.

After the roll call, you,as the moderator, should introduce yourself to the group if you are not already known. This is the time when you should welcome the group to the meeting and introduce any new members, guests or guest speakers - even if they've been addressed during the roll call. If you are using a Convener or other conferencing device and have others in the room with you, introduce them at this time.

When introducing anyone on line, do it in such a way that he has to respond by saying hello or where he is calling from. It is important that the other participants hear his voice.

For example:

"This is John Scott. As national sales manager for AJAX Company, I know most of you who are on line with us today.

I want to welcome all of you and I'm glad you were able to call into this important meeting.

Before we start, I want to mention that I have Tom Smith, our director of marketing, in the room with me.

Tom, it's nice to have you with us. How are you today? "

(Tom Smith replies)

"Before we begin the meeting, I have a few announcements....

State Purpose & Objective

This section is simply a re-statement of the purpose and objective you defined earlier in your preparation for the meeting.

For example:

"Now to begin our meeting....
As you know, the purpose of this meeting is to discuss the entry of a competing product called ATAR into the marketplace.

I hope that we'll be able to accomplish two things with this meeting today.

They are as follows:

A) To assess the potential threat this new product poses to our share of the market

B) To determine an appropriate course of immediate action to counteract the threat"

Review Agenda

At this time refer to the agenda, if it was sent out with the notification and explain how you plan to proceed.

If your participants do not have the agenda in front of them, then you should list the items on the agenda in the order you will cover them.

Remember, on an audio telephone conference a certain amount of repetition is necessary for the group to be able to follow along and to perceive the direction of the meeting.

As an example:

"First we're going to assess the threat that ATAR poses by having a report from our director of marketing, Tom. And then we'll go to the group for opinions from the field.

Second, we'll discuss various alternatives or courses of action that we could take.

And finally, we'll decide on the best course of action to take immediately."

Agenda Items &"Agenda Modules"

In preparing an On-Line Agenda for a teleconference - and in conducting a meeting by teleconference - there is only one absolute rule that you should follow whenever possible:

> In order to hold your listeners' attention for more than 3-5 minutes, you must have -
>
> 1. Changing speakers (voices)
> 2. Interaction or dialogue
> 3. Involvement of group members

Therefore, even your fifteen minute agenda modules need to be organized into smaller five-minute segments of time interspersed with a change of voices, interaction or involvement of some kind.

It is this basic fact - that you cannot hold someone's attention for more than 3-5 minutes at a time-that forces the telephone conference into an interactive mode. Because it has to be interactive to be effective, the teleconference done correctly is better than a meeting face to face.

To help you determine the best and most effective presentation style to use for the items on your agenda, certain models called "agenda modules" are presented here for you to use.

Each agenda module is structured to capitalize on the interactive nature of the teleconference medium and it is designed to hold the attention of participants and to involve them in meaningful ways. Since it is a good idea to break a teleconference meeting into fifteen minute segments, each agenda module is approximately ten to fifteen minutes long. It is a good idea to assign one agenda module to each item on your agenda.

To select an appropriate agenda module, you should first analyze the direction of communication flow. In any meeting there are two paths of communication flow. The first is information out from the moderator or principal speakers to the group. The second is information in from the group to the moderator.

Any information that goes out from the moderator or speaker to the group is basically presentational in nature. For our purposes, we will call it a "broadcast" mode. From what we already know about teleconferencing, we can tell that an agenda item that necessitates "information out" or "broadcast" mode is in danger of losing the group's attention if it continues for more than five minutes without interruption.

However, there are ways to structure such material effectively and interactively. Agenda modules entitled "Broadcast Modules" will present some models for effective teleconference delivery of "information out" items.

There is another very important fact about teleconferencing to remember. Whenever possible, lecture material and any large amounts of information should be "packaged" in some form and sent out in advance. Videotapes, slides, or even written form is the best way to present such material. A telephone conference is an interactive medium and should be used as such. Use the teleconference to clarify, reinforce and elucidate information sent out in advance. Obviously, when there is a critical shortage of time and information must be transmitted to everyone simultaneously, the teleconference is the only way it can be done.

The second path of communication

flow in which information comes in from the group to the moderator is the "interactive" mode and is absolutely compatible with interactive requirements of the teleconference.

Agenda modules that suggest models for structuring "information in" type items are presented in "Interactive Modules."

Broadcast Agenda Modules

The broadcast agenda module is designed for those items on the agenda that are presentational in nature and require one-way communication from the moderator out to the group. This path of communication flow can be incompatible with the teleconference medium if it is not restrained to five minute segments and interspersed with some form of interaction.

Following are some effective broadcast agenda modules:

Interview .

5-10 minutes: Interview the speaker or presenter with questions designed to elicit the presentational material.

5-10 minutes: Poll individuals in group for questions or comments

Reporting.

3-5 minutes each: Ask a few participants or speakers to prepare a brief report on a portion of the subject at hand. Have each, in turn, report. Pause between each report to comment or repeat significant points made.

Or, more simply, parcel out portions of the meeting to other people. This will make conducting the meeting easier on yourself while making it more interesting for your listeners.

Straight Presentation.

5 minutes (10 minutes with slides or some visual support): Deliver your presentational material in 5 minute segments interspersed with interaction in any of the following forms:

10 minutes or more: Poll individuals for comments, or better still, ask them specific questions. (Do not say "Are there any questions?" you will rarely get good responses.)

10 minutes: Case study or Problem: Focus on a case study, problem or exercise to reinforce the presentation.

Panel Discussion.

10-15 minutes: Select a panel of 2-4 people. Pose a question or problem and ask each to comment in no more than 2-4 minute segments.

As moderator, interject your comments or observations at appropriate junctures. This works best if there is some controversy, ambiguity or debate.

Obviously, these agenda modules and the requirement of five minute segments are ideal. A moderator can often get away with talking for as much as ten minutes at a time. Also, constraints and urgent situations may require that large amounts of information be "broadcast" to many sites or individuals at once. When necessity forces you to stretch these rules, just be aware that you are requiring more effort and concentration from your group and that you may not be able to hold their attention as effectively.

Interactive Agenda Modules

The interactive agenda module is designed to help you structure and organize those portions of your meeting that require getting information in from the group. This communication flow is, by nature, interactive, which makes it compatible with the teleconference medium. Therefore, the five to ten minute time segments found in the broadcast agenda modules are not so important here. In fact, if an entire meeting requires feedback and information in from the group, one of the interactive agenda modules could be used for the whole meeting.

Following are some suggested interactive agenda modules:

Roundtable Discussion.

Pose a question or ask for comment and poll each participant for his response by going "around the conference." Budget 1½ - 2 minutes for each response.

Or, if time is limited, poll four individuals for their opinions and ask the rest if anyone has something to add.

Brainstorming.

Phrase a problem or question. Set a time limit of 60-90 seconds and ask each participant to jot down as many ideas or thoughts on the question at hand as he can. The key is to write down as many as possible spontaneously while reserving judgment on each item.

Then poll each person for one of the ideas on his list that has not been mentioned by someone else. Have each participant list these items too.

Summarize, and conduct a roundtable discussion on the best ideas.

Case Study or Problem Exercise.

Present a case study or sample problem in advance or during the conference. Allow a few minutes of silence on line for each person to formulate his answers on one or two questions you have asked regarding the problem.

Poll each participant for his answers or solutions or opinions. After you have obtained all of the responses, then summarize and comment on them.

You may wish to divide the conference into two groups by giving them either two different problems or the same problem with different questions.

It should be noted that it is possible to have the Darome Connection break a conference into subgroups for small-group discussion.

This module is especially effective when it provides the interactive counterpart for material that has been presented. It helps to reinforce understanding of the information presented.

Q & A.

Question and answer periods are effective when they are conducted in the manner of a roundtable discussion.

It is not advisable to say, "Are there any questions?" for two reasons: you rarely get good - or very many responses; and if you do get response, you may hear the garble of many voices at once or clipping as one voice overrides the others.

Therefore, it is best to address specific individuals for question or comment. You will get much more interaction with this method since each has to respond in some manner.

When you do have to ask a general question of the group, do so by exception. For example, "Who has not received the new sales kit.? Asking questions by exception will elicit the fewest simultaneous responses and will minimize the confusion of overlapping or clipping voices.

One interactive agenda module can be used for an entire meeting although changing modules every fifteen minutes will add variety and sustain interest.

A simple way to organize a good teleconference meeting is to alternate broadcast mode information with interactive elements or interactive agenda modules. It should also be noted that involvement does not always have to be verbal. If your listeners are working on a problem or jotting down thoughts as in the brainstorming module, they are involved.

Now that the agenda modules have been explained, we can resume constructing the sample On-Line Agenda for the teleconference meeting on the competing product ATAR. The task involves analyzing each agenda item to determine if the communication flow is out or in and then selecting an agenda module to use for that portion of the meeting.

Agenda Item #1 To assess the threat of competing product ATAR
(Total 15 minutes)
Background information and present knowledge regarding the product:

(Information Out)

Reporting Module 5 minutes
Report from headquarters by Tom Smith, director of Mktg.

Input from the Field
(Information In)

Roundtable Module 10 minutes
Poll each participant about effects on sales to date

Agenda Item # 2 Suggested Courses of Action
(Total 15 minutes)
(Information Out)

Panel Discussion Module
10 minutes
Ask three people before the meeting to each suggest one alternative and to take 3 minutes to present and explain it on the conference.
5 minutes
Ask if anyone in group has something to add or suggest.

Agenda Item # 3 Consensus on Immediate Action To Be Taken
(Total 15 minutes)

(Information In)

Roundtable Module
15 minutes
Poll each participant for opinion on which of the three suggested alternatives he advocates and why.

Summary & Close

As with all other portions of the On-Line Agenda, the "Summary and Close" is also important because it enables everyone to leave the meeting with a clear sense of what transpired and what has been accomplished.

You should review the important points covered in the meeting and summarize the conclusions reached or the decisions made. If the conclusions reached correspond closely to your objectives for the meeting, you have been successful.

Before closing, mention any next steps to be taken or the next meeting date.

Perhaps most important, thank everyone for their contributions,

As an example:

"Before closing, let me summarize - Most of us seem to agree that the greatest threat of ATAR to our share of the market will occur in the beginning when our competitor is promoting ATAR most heavily.

Of the alternatives discussed, we agree that the best action to take immediately is to make a special offer on our product to defuse the effect of the promotional campaign for ATAR.

We will have another conference later this week once the details of the special offer have been worked out.

Does anyone have any final comments before we close the meeting? ... Fine....

I want to thank all of you for your valuable contributions to this meeting. I'll be talking with you again later this week. Have a good day...."

This completes the steps in preparation for a meeting by teleconference. It is obvious by now that the most important element in conducting an effective meeting by teleconference is the preparation. Once the On-Line Agenda has been developed, you have a blueprint for the entire meeting in front of you.

When you are familiar with this method and have made adaptations to fit your style or your material, you will find that you can put an On-Line Agenda together in a few minutes when you have to.

CONDUCTING THE MEETING

Since the secret to conducting a good teleconference is in the preparation, there are only a few additional suggestions:

- Try to avoid having anyone talk continuously for more than five minutes without the visual support of written material, slides or freeze-frame video.
- Different voices will help to hold the attention of your listeners so poll individuals for comments and opinions or ask different people to take over portions of the meeting.
- As moderator, pause frequently to allow for questions. Do not be afraid of pauses and silences. These give your listeners time to think and phrase their comments.
- Have anyone who asks a question or speaks spontaneously to identify himself.
- Select a telephone in a quiet place from which to conduct your meeting. Your office or a conference room is probably the best. Make sure you will not be interrupted by other phone calls or be distracted by people coming in and out of the room
- Set aside at least five minutes before conference time to sit quietly and collect your thoughts alone. A teleconference requires a slightly different type of concentration and "one-pointedness" than we are accustomed to. Going directly from activity into the conference will cause your thoughts to be scattered and less focused.

- To be a good moderator, you have to be a good listener, sensitive to what you are hearing and to what each person is trying to say. For this reason, some moderators find it distracting to have other people in the room with them when they are running a teleconference. Others, however, frequently run conferences using a speaker phone or Convener with three or four participants in the room with them and have no difficulty. Experience conducting one conference will quickly tell you whether you prefer to be alone.

- Have the following items in front you before starting a conference:

  On-Line Agenda
  List of Participants
      Keep track during the meeting of those you have polled for responses and participation.
  Clock or watch
      Stick closely to the time schedule on your agenda
  Background or advance material
      sent out to participants for the conference

CONCLUSION

The guidelines set forth above are for informal business meetings that consist of several individuals calling in on telephones. One or two of the calling locations may have small groups participating by means of a speaker phone or Darome Convener.

Conferencing with groups of people at each location for training programs or other special purposes requires a special set of instructions. However, all of these basic guidelines still apply. It is just that group conferencing is more difficult and requires more careful planning and coordination.

THE FUTURE OF VIDEOCONFERENCING:
THERE'S MORE THAN THE MEETING TO CONSIDER

Karen File
Vice President
National Analysts

Robert Forrest
Market Staff Analyst
AT&T Long Lines

Alan Kuritsky
Staff Manager
AT&T Long Lines

Sally Leiderman
Study Director
National Analysts

The thought of the videoconference becoming an important tool for corporate America in the 1980's seems quite logical in these times of expensive energy and lagging productivity.

What better way to enhance white-collar productivity than to take executives off the airplane and into the meeting room for a videoconference with peers a thousand miles away? And, what better way could there be to reduce soaring business travel costs and conserve energy than to let the videoconference replace face-to-face meetings whenever possible?

At first thought, the future of videoconferencing in the United States seems secure. A closer look, however, reveals that there are much deeper considerations -- particularly about the nature of the potential user company -- to consider before any wide-scale implementation of videoconferencing can approach reality. And these issues must be considered even before budgetary considerations can be made.

The following report presents some of the salient conclusions about the potential acceptance of videoconferencing reached in a large-scale nationwide market survey of 2,000 general business managers. The survey was conducted by the National Analysts Division of Booz·Allen & Hamilton, the international management and technology consulting firm, for AT&T Long Lines. National Analysts is a market research organization consisting of research professionals with wide-ranging expertise, including telecommunications specialists.

As part of their training for this assignment, many of the interviewers participated in videoconferencing sessions. And, those who interviewed telecommunications specialists were specifically trained in the language of teleconferencing so they could discuss the subject and all of its technical aspects on a peer basis.

While the survey concluded a number of major findings, it is important to note just some of the highlights that could have a significant impact on the future course of videoconferencing:

- The characteristics of the potential user are more important in predicting a company's likely acceptance of the videoconference than the characteristics of the meetings themselves.
- The usual format or type of meeting that would be subject to a videoconference is not really essential or helpful in predicting the future acceptance of video as a business tool.
- There is an underlying phenomenon that ties together both the importance of the characteristics of the potential user and the usual type of meeting that might be videoconferenced. This leads to a very fundamental question: Is this meeting in this environment with these users videoconferenceable? Until now, research in the field centered almost exclusively on the characteristics of the meetings in question. The new research shows, however, that a greater depth of understanding is essential.

Another major point the survey indicates is that managers believe that videoconferencing is equally applicable for meetings in which all participants are from the same company and for meetings in which at least one participant is from outside the firm. Until now, videoconferencing had been considered almost exclusively as an internal communications tool.

In order to anticipate the market acceptance of videoconferencing, two possible information sources are available:

- The opinions of those exposed to videoconferencing demonstrations (Project Prelude, Bell Canada, Picturephone® Meeting Service)
- The opinions of those not exposed to videoconferencing demonstration projects who nonetheless constitute the primary market for the capability

Most investigators have focused on the first group, and have provided the field with a number of valuable insights. A relative few have chosen to explore the attitudes of the second group.

The Videoconferencing Meeting

The question of whether business meetings are suitable for videoconferencing has been explored extensively. New users of video have typically had positive feelings toward the use of videoconferencing (Duncanson and Williams, 1973; Williams and Holloway, 1974; Champness, 1973; Ellis, McKay, and Robinson, 1976; Reid, 1970). Some studies have described how individuals behave differently when they experience videoconferences than they would have in a face-to-face meeting. Other studies have looked at how this behavior change can be successfully utilized in a business setting.

A number of common business problems, such as exchanging information, asking questions, offering opinions, problem solving and generating ideas, have all been demonstrated to be satisfactorily accomplished using video (Champness, 1973; Williams and Holloway, 1974; Jull and Mendenhall, 1976). The type of group which assembles for a video meeting also does not seem to be a key determinant of whether or not the meeting can be successfully teleconferenced (Noll, 1976 and Strickland, Guild, Barefoot and Patterson, 1975). Furthermore, videoconferencing seems less likely to cause groups to split into leaders and followers than meetings held in person (George, Coll, Strickland, Patterson, Guild, and McEown, 1975).

Individuals do not seem to have a specific problem persuading other people via video (Short, 1972). One problem that can occur in business meetings when using video, however, is the tendency for strangers not to get to know one another as well as they would in a face-to-face meeting (Christie and Holloway, 1975; Jull and Mendenhall, 1976). Also, meeting participants may express themselves less personably (Short, Williams, and Christie, 1976), or may behave more stiltedly than they would act in a business setting (Bretz, 1974).

The issue of meeting efficiency also becomes significant when videoconferencing. Williams and Holloway (1974) found that video meetings seem to be conducted more quickly than face-to-face meetings. In fact, Noll (1976) found video to be perceived as more satisfactory than face-to-face for handling regularly scheduled communications and for giving or receiving information. Moreover, Champness (1973) and others found that video meetings are perceived to be more orderly than face-to-face meetings. Finally, a number of non-published studies conducted by AT&T suggest that the types of meetings where video communications could result in a highly productive meeting included:

- Short meetings where a break was not required
- Meetings that have specific purposes and goals
- Meetings where agendas are preplanned and highly structured
- Small group meetings (2 to 4 participants maximum at each end)
- Meetings in which participants know each other in advance
- Meetings in which the seating of participants is preplanned so that individuals having common interest or problems sit next to each other

The survey analyzes the opinions of a cross section of business people at different levels of business. Participants were asked to present their views of their present meeting behavior and their reaction to using video in these meetings. Before examining their current and anticipated meeting behavior, it is appropriate to describe the study methodology.

Methodology

Data were taken from a sample of about 2,000 businesspeople (middle, upper and top managers as well as technical and professional staff selected from a list of business leaders) who were interviewed by telephone. The managers surveyed represented a thorough cross section of managerial levels, functional areas, and ages. This breadth of rank, function and work experience was deemed essential in order to gather information that would not be biased in advance.

The methodology called for respondents to identify the most recent meeting they had attended with three or more participants, where at least one person had to travel 30 minutes from the office to attend. This type of meeting was assumed to meet the minimum standards for a "videoconferenceable" meeting.

We also asked managers to describe the salient characteristics of this "videoconferenceable" meeting -- the purpose of the meeting, its length and whether documents or other materials were used. Once these characteristics were enumerated, and the meeting event was crystallized in the respondent's mind, we described the videoconferencing capability and asked for an estimate of the probability of using video for that recent meeting. (All interviewers read the same concept statement of videoconferencing to respondents.)

Current Business Meeting Behavior

Before analyzing the amenability of different types of business meetings to videoconferencing and the willingness of managers to choose a videoconferencing mode, it is appropriate first to describe current business meeting behavior.

As one might expect, top, upper, and middle managers attend the largest number of videoconferenceable meetings; first-line supervisors and junior or senior staff professionals attend fewer videoconferenceable meetings in a month. Predictably, individuals in marketing and sales attend more videoconferenceable meetings than do managers in other functional areas. Meeting attendance was also discovered to vary by industry segment and, to a similar extent, by company size. For example, sales and marketing managers attended more recent videoconferenceable meetings than did those in manufacturing or distribution areas of responsibility. By far, the most frequent reason to hold a videoconferenceable meeting is to exchange information. Other meeting purposes -- negotiating or bargaining, buying or selling, resolving a crisis, and introducing new people to each other -- are comparatively infrequent.

Managers of different levels or areas of functional responsibility appear to attend the same proportion of meetings of each type.[1] The types of videoconferenceable meetings do not vary significantly by respondent or by company characteristics.

For all levels of managers, the most recent videoconferenceable meeting was perceived to be "somewhat" or "extremely" important[2] prior to the time it took place. Slightly more top-level managers regarded the most recent meeting as "extremely important" as opposed to "somewhat important." By contrast, managers below the topmost level chose "somewhat important" over "extremely important" in about the same proportion. The modest difference may well reflect the "buck stops here" attitude at the highest management level.

Similarly, more top-level managers attached a rating of very high or very low risk associated with the most recent videoconferenceable meeting than did their associates lower in the corporate hierarchy. Most responses by first-level to upper-middle managers indicated generally moderate risk.

Not surprisingly, the number of participants at videoconferenceable meetings varies with company size. More people assemble to work together in larger organizations. The length of meetings also varies with the number of attendees; the addition of more people, presumably generating a larger volume of thoughts and ideas and possessing a need for expanded communication and interaction, results in more time needed to complete a meeting.

Meeting length is impacted by the type of videoconferenceable meeting. Typically, buying and selling occupy the shortest time frames, while negotiating and bargaining take longer. Crisis resolution is more evenly distributed across the duration categories.

Slightly more than half of the videoconferenceable meetings involved personnel from other than the respondent's firm. Interestingly, the average meeting length is shorter for those meetings involving managers from different companies than for intra-company meetings. Extremely important meetings are finished quickly.

Graphic aids -- ranging from handouts to movies -- are used in approximately two-thirds of the meetings held. Virtually none of the managers surveyed dismissed graphics as unimportant, and a large number of the respondents termed them essential for accomplishing the goals of the last meeting.

One of the survey questions had to do with how often the respondents who ever attend videoconferenceable meetings must travel overnight in order to participate. Answers show that first-line managers travel overnight seven times per year to attend meetings, while respondents at higher management levels travel twice as frequently.

Curiously, the willingness to travel is independent of the amount of travel one does. A majority of business managers stated that they preferred to travel about as often as they do now, regardless of how much business travel they currently do. A smaller, but by no means inconsequential group, would prefer to travel less often, while only a miniscule proportion of respondents expressed a desire to travel more frequently. The desire to travel or not to travel seems to be explicable by personality variables rather than by the professional level or functional area of responsibility.

Anticipated Videoconferencing Meeting Behavior

Business managers believe videoconferencing could fill a wide range of business needs. While the medium is preferred more for some applications than others, the types of meeting characteristics just described do not appear to substantially affect the likelihood that videoconferencing would or would not be used for a specific meeting. Rather, there seems to be an underlying phenomenon that helps to explain why some kinds of businesspeople would choose videoconferencing for some kinds of meetings. Before elaborating on the specific nature of this phenomenon, it is helpful to look at business managers' opinions about the potential use of videoconferencing.

Business managers are willing to use videoconferencing for business meetings with different purposes, with one exception. While they use the videoconference about as often for meetings to exchange information, negotiate or bargain, or buy and sell, they would be less likely to use this tool for meetings whose primary purpose is to introduce new people to each other. In this regard, preferences of potential users mirror the opinion of videoconference experts.

In addition to the purpose of the meeting being relatively inconsequential to the acceptance of videoconferencing, the number of participants and the length of the meeting are not important considerations. Business managers believe videoconferencing has equal application for meetings with from 3 to more than 13 participants, although meetings with 7 to 12 participants are slightly more likely to be viewed as appropriate for videoconferencing.

Likewise, business managers feel videoconferencing is equally applicable for meetings where all participants are from the same company, and for meetings where at least one participant is from a different company.

It is also interesting to note the various meeting lengths for which managers believe videoconferencing could be used. Survey respondents thought videoconferencing was best suited for meetings lasting between one and one-half hours and three hours. At the same time, much shorter and much longer meetings were also considered videoconferenceable.

As one would expect, businesspeople think videoconferencing would be used much more frequently for meetings in which audiovisual aids were used than in meetings where they were not. However, the exact type of audiovisual aid makes little difference in managers' perceptions about which meetings would be held on the medium. Thus, while some slight preferences emerge, the specific characteristics of the meeting, such as meeting length, number of participants and the like, are not the determining factors in deciding where the medium could be used.

General managers who are content with the amount of travel they do are less likely to think videoconferencing would be helpful than either those who wish to travel more or those who wish to travel less. Thus, business managers who are discontented with their current business meeting behavior are more likely to see potential for videoconferencing than those who are complacent.

The perception of business managers, then, is that videoconferencing could have been used for meetings of various purposes, with differing numbers of participants, and lasting between a few minutes and several hours. However, certain kinds of businesspeople are more likely to use the medium, regardless of the type of meetings they attend.

Specifically, engineers, professionals and technicians consider themselves likely users, while top managers do not.

Conclusions and Implications

What do these opinions of the mass market mean for the future of videoconferencing? In order to answer that question, it is necessary to understand why businesspeople react to the concept of videoconferencing as they do. Specifically, it is important to speculate on the reasons that characteristics of users are more important than characteristics of meetings.

We believe that the function of business meetings can be described by a continuum between two polar ideas. On one hand, there are meetings with the primary objective of establishing contact between meeting participants, perhaps for the purpose of establishing or continuing a relationship, or reassuring someone that a problem or issue is being "looked into." Or, perhaps the meeting itself serves as a reward. These types of meetings may be attended by persons of differing rank, where status and deference symbols are important. Audiovisual aids may or may not be needed for such meetings. However, these materials would be characterized by lack of task orientation. Meetings at this end of the continuum can be referred to as "contact-oriented" meetings.

At the other end of the spectrum are meetings whose function is to get something specific accomplished -- "task-oriented" meetings. Such meetings will typically involve businesspeople in more lateral positions, who have worked together in the past. Where audiovisual materials are used, they are likely to be important to getting the task accomplished. The meeting will be successful only if it accomplishes its goal, unlike "contact-oriented" meetings that are successful merely by virtue of having been held.

We believe videoconferencing is more likely to be used for "task-oriented" meetings than for "contact-oriented" ones. One reason is that videoconferencing tends to equalize the status of the various attendants. Because all participants in a videoconference are outside their usual office environment, certain status symbols like outsize chairs, awards or other wall ornaments and the like are not available. Further, the standard videoconference room configuration does not allow persons to dominate the meeting in traditional or accustomed ways through physical placement. In a videoconference, participants sit along one side of a table. In non-videoconferenced meetings, leaders gravitate to the "more powerful" end positions. In addition, each person that attends a videoconference must travel at least some distance to participate, even if the room is only down the hall. Thus, the normal deference distinctions between host and guest are obscured. Finally, contact-oriented meetings are often held because someone wants to "press the flesh." These types of meetings have a tactile, as well as an oral and visual, component.

It should be clear from this discussion that videoconferencing is not well-suited meetings that are primarily contact-oriented. What is a barrier for contact-oriented meetings, however, is a benefit for task-oriented ones. First of all, status symbols, tactile interaction and deference patterns are not important for these kinds of meetings. In fact, the absence of these features may act to promote efficiency. Secondly, there is some evidence that videoconference meetings are shorter, more structured, and more to the point, as task-oriented meetings should be. Finally, the very nature of the medium encourages its use for meetings that require the participants to see something, such as blueprints, tables, objects and the like. The need for audiovisual capability is more closely associated with task-oriented meetings than contact-oriented ones.

Business managers' opinions about the likelihood that videoconferencing would be used for their last meeting can be understood better in terms of this continuum. That is, while the continuum is defined in terms of meetings, it does not rely on specific meeting characteristics, such as length, number of participants, or even purpose as previously defined. Rather, a specific meeting falls in its place on the continuum because of an interaction between the goal of the meeting, and the personality or style of the primary meeters, e.g., the person who calls it, structures it and/or runs it. Thus, in answering the question whether "this" meeting (as defined by overt purposes), in "this" environment with "these" users is videoconferenceable, this additional dimension has considerable significance.

Footnotes

[1] Among the exceptions we find: sales and marketing professionals attend more sales meetings; top-level managers enter into more negotiations; and staff professionals and technicians schedule more meetings for the purpose of information exchange. Crisis resolution occurs among the levels of staff professionals through upper-middle managers; interestingly, top management has far less need to mobilize to turn around a crisis solution.

[2] The relative degree of "importance" of the most recent meeting compared to other meetings was rated by respondents as being "extremely unimportant," "somewhat unimportant," "somewhat important," or "extremely important."

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TELECONFERENCING AT DIGITAL EQUIPMENT CORPORATION

Frank Duffy
Consultant
Digital Equipment Corporation

Introduction

DEC is a young company but is growing rapidly. The corporation was founded approximately 20 years ago and now has approximately 45,000 employees. With over 35 plants worldwide, the need for rapid communications is paramount.

Our teleconferencing experience is only a few years old but (increasing concern for energy and expense) require us to keep abreast of what is happening in this field. Competition requires improved productivity, shortened decision making cycles, more effective use of time and decreased costs.

This paper will cover audio conferencing, both full motion and slow scan television, and computer conferencing.

Background

Our early teleconferencing experience goes back more than 5 years and is what is now known as computer conferencing. In those days it was known as "Mail" or "Mailbox" and was not called electronic mail.

Since then we have had limited experience with AT&T's Picturephone Meeting Service and considerable experience with audio-conferencing.

Operational Programs

The following programs are operational:

-Audio Conferencing
-Computer Conferencing & Electronic Mail

Audio Conferencing

This service has been in use for several years and is continuing to grow. At present, over one dozen conference rooms are equipped with audio conferencing equipment. In most cases the equipment used is a "speaker phone" and no additional changes were made to the room.

The Northern Telecom #2000 is used as well as AT&T portable units. The 2000 blends well with office furniture. The immediate advantage is that conference members treat it as just a piece of furniture and do not react in the same manner as those confronted with a microphone for the first time.

Facsimile Equipment

Over 200 facsimile units are installed and in several cases are used with audio conferences. Usually the unit is adjacent to a conference room and is also available for general use.

Computer Conferencing

This term takes on various meanings and it appears that we are in our second generation of computer conferencing.

The first generation was primarily an exchange of messages through a PDP10 timesharing system.

The second generation came along with the broad internal acceptance of Electronic Mail. We now have over 1000 users who are supported by three PDP11 systems.

In some cases, computer conferencing infers considerable document recall and preparation. We are not heavily involved in this type of activity, but this may evolve as our third generation. It will probably be based on the confirmation of communicating word processors and electronic mail system.

Development Project

There are two major development efforts underway in parallel.

1) Slow Scan Television

This technique is also known as"freeze frame". The image builds up, on the screen, a line at a time rather than with high speed a viewer is accustomed to seeing on a conventional video unit.

Our first test will be with black and white cameras and voice grade phone lines. The users will be in Maynard, MA and Colorado Springs, Colorado. In both cases they will represent Manufacturing and Engineering groups.

These groups currently engage in audio conferencing daily and the group members are well known to each other. The audio system is well regarded and is evidenced by a radical decrease in travel. Prior to its introduction in 1979, approximately 5 people were flying between Mass. and Colorado each week. Since the introduction of audio conferencing, this has been reduced to five trips per business quarter. Naturally, not all this change is attributable to teleconferencing, but it has made a substantial contribution.

Expansion is expected in two phases. Following the test period, if everything is successful, three more Massachusetts plants will be brought into the system. They are:

Natick
Springfield
Marlboro

The Springfield plant is a two hour drive from the Maynard headquarters and half a day can be wasted on a round trip. We have helicopter service between these two points but periodically weather is a problem and only four passengers can be accommodated.

The group in Marlboro has already mentioned that if the first two phases are successful they will then extend to Hong Kong.

2. Full Motion Video

This project is related to the establishment of a microwave link between Massachusetts and New Hampshire. Our Merrimack, New Hampshire facility has three large conference rooms designed with video conferencing in mind. Approval for a microwave tower was obtained 5 years ago in anticipation of high communication needs.

Maynard and Merrimack are approximately one hour apart. Commuter vans run between these two points and twenty-four helicopter flights are made daily.

This system is expected to be operational by late 1980.

3) Special Projects

a) Annual Engineering Meeting

For the past four years our Engineeing group has held its major annual meeting at a resort in Vermont. Last year closed circuit TV was used within this conference facility and was considered highly.

This year the plans are to use a combination of full motion videos and slow-scan to bring hundreds of additional people into the meeting. The majority will be serviced by one-way video and two-way audio between Vermont and sites in New Hampshire and Massachusetts. The New Hampshire location is Merrimack at the Massachustts locations are:

Maynard
Tewksbury
Marlboro

Slow scan will be used to further extend the signal from Massachusetts to Colorado.

The current plans are to use AT&T microwave service in New England.

b) Public Service Satellite Consortium

The use of PSSC services were considered for this meeting and they introduced a number of interesting possibilities including portable earth stations. Our original plan was to use PSSC to carry live video from Vermont to Boston. The signal would then be carried via land line to Maynard. Out west, the satellite signal was to be picked up in Denver and then sent via land line to Colorado Springs.

Other alternatives considered were the use of portable satellite receiving stations in Maynard and Colorado Springs to avoid use of the land lines.

However, due to the nature of the meeting, the user then requested security be provided for both the audio and video portion. PSSC could not meet these requirements and still stay within our budget.

c) Picturephone Meeting Service

Three of the AT&T rooms have been used to conduct business between Boston, New York and California.

In the case of Boston- New York, the participants felt that in 1 1/2 hours they had accomplished what would have required 9 hours to do on a door to door basis. In this case, documents were transmitted via facsimile and a contract was negotiated.

More recently we attempted to link the Boston PMS to Canada but were unable to do so since both countries are still restricted to domestic use during their test periods.

d) Conference Centers

Specially equipped conference centers exist in some foreign countries. We are actively seeking to identify such centers particularly in our most remote regions.

The Heathrow Conference Center (England) is a specially equipped facility with 260 personal size TV sets. Each of these sets has a "voting" button which permits audience interaction.

Similar facilities are expected to be offered by some of the major U.S. hotel chains.

e) Electronic Blackboard

AT&T's offering called GEMINI is expected to be tested in our software development group. Members of this group are roughly 25 miles apart and expect to avoid three meetings per month by using the Electronic Blackboard in conjunction with audio conferencing.

f) VISTA Project

Vista is the name of one of the VIEWDATA type services being tested in Canada. TELETEXT is a generic name being given to services which combine computers, text, image retrieval, home TVV and phone lines. Services of this type are three years old in Europe and are working their way to North America and elsewhere. I believe TELETEXT services will become an adjunct to teleconfferencing. Keyboard activation of TV sets, located in conference rooms, may well become a type of remote slide projectors.

g) Remote Meeting Rooms-

This is a difficult subject to describe, but points out the strong desire for meeting participants to kknow the identity of a speaker from a remote location. For example, in a New York to Paris hook up, a speaker would be assigned a fixed seat location and a corresponding light would be activated at the remote location, when speaker number one was addressing the group.

Rooms of this type have been set up in New York and Paris and others are planned in California.

h) Portability

This term may be a misnomea but is one we used to describe our desire to avoid just studio environments. Under this heading we are investigating mobile vans and cameras.

Human Factors

Although our experience is limited, we are sensitive to various technical and social factors influenced by teleconferencing.

Under the heading of "meeting protocol" we are looking at the differences in starting and concluding meetings which are not conducted on a face-to-face basis. This is best illustrated by audio conferencing situation in which the remote participants cannot be certain if the make up of a group has changed since the start of a meeting. It is currently the responsibility of the chairperson to notify participants about changes in the audience.

Some of the considerations for video conferences are eye-contact and image reversal. Eye contact is influenced by the number and position of cameras. Image reversal relates to how a viewer sees themselves or others on a TV monitor. Our experience has been that after the first 10 minutes, participants are acclimated to their new surroundings.

"Continuous presence" is a term which conveys the idea that remote participants are really only at the other side of the room, rather than thousands of miles away. This illusion is fostered by the use of color and screens which project life-size figures.

Benefits

The various forms of teleconferencing are being presented as alternatives and not as a panacea. On this basis we expect travel to be reduced but not eliminated. We also expect that teleconferencing will be recognized as a management tool which provides an increased span of control.

PATHFINDER VIDEO
TELE-SEMINAR SYSTEM

Elliot M. Gold
and
Robin A. Winkelstein
Jet Propulsion Laboratory

The King of ID, of cartoon strip fame, once provided a glimpse into the consequence of speaking in undefined terms. Consider the following:

(In the first panel the King is addressing a guard)
KING: I'm putting you in charge of environmental protection.
GUARD: Right, sire.
(In the next panel the guard comes upon a peasant observing his little girl playing on a swing hung from the limb of a magnificent tree).
GUARD: That's a nice tree you've got there . . .
PEASANT: Thank you.
(Last panel)
GUARD: . . . For ten dollars a month we'll see that nothing happens to it.[1]

In order to avoid that error in this paper, we shall define teleconferencing at the beginning. Here we will use the definition "interactive group communication through an electronic medium".[2]

The Jet Propulsion Laboratory (JPL), as a member of the NASA Audio Teleconferencing and Facsimile Network, has for a number of years used teleconferencing for a variety of intra- and interorganizational meetings.[3] Audio teleconferencing has only been moderately accepted by JPL employees.[4] In addition, as has been the experience reported elsewhere, potential users have expressed a desire to experiment with video conferencing where they can see the people at the other location with whom they are speaking.[5] JPL is no different. After several experiments using slow scan television, the Laboratory began to look for a way to test full motion video conferencing. In this situation, the participants can see continuous motion images showing participants and props (viewgraphs, objects, etc.) on a television monitor. The opportunity presented itself in the form of a microwave link designed for telephone and data transmission between JPL and its parent institution, the California Institute of Technology (Caltech).

Background

In the Fall of 1978, JPL installed a dedicated communications system between its primary physical location in the northwest corner of the city of Pasadena, and Caltech, located in the southern center of Pasadena. The system was purchased and is currently maintained by JPL. Simply put, the system is composed of two microwave dishes located on each organization's tallest building, with support electronics located within the building below. Cables connect the microwave equipment to other buildings where computer and telephone equipment communicate with compatible equipment. The system was configured to have capacity for voice and data channels with sufficient bandwidth left over for two video and two broadcast quality audio channels.

The system had a rapid payback based solely on its replacement of leased phone lines for the telephone and data service.

The video and broadcast audio were therefore available for full time experimentation without interfering with the payback schedule.

As early as January 1978, it was suggested that the link be used to facilitate such experiments.[6] Reference was made to an even earlier study of the level of technical communication between JPL and Caltech. In that study the following was suggested:

> The Campus and JPL are jointly renowned for their communications and information management. Excellent presentations have been made on the wisdom of transporting information instead of people and goods when the objective is to transport information.
>
> Yet between these two sites there is a noticeable lack of use of closed-circuit TV and remote monitor displays to facilitate Campus-Laboratory communications. TV systems can be used to advantage by displaying significant mission activities, seminars, and lectures.
>
> Attempts to bridge the 7-mile separation of the two sites should make use of this most common technology in our society as follows:
>
> - o JPL should see that interesting events are displayed in such places as the Winnett Student Center and that these displays be accompanied by comprehensive voice information suitable to the background and interests of faculty and students.
> - o Video displays should be extensively used to permit research conferences and seminars to be exchanged.
> - o When the interest warrants, video displays should be used to provide courses at JPL for audit.[7]

Shortly after the publication of this study, the JPL Audio Visual Communication Section began transmitting color video images of mission encounters (such as Voyager and Viking) from JPL to Caltech. They used telephone company microwave equipment for this purpose.

Since the Fall of 1976, JPL and Caltech have conducted a series of technical lectures scheduled after work hours and directed at Caltech students and staff and the staff of JPL. In most cases the speaker was an employee of JPL. The lecture seemed to be a convenient vehicle for a video conferencing experiment, and was formally identified as such by an ad hoc committee from JPL.

As a result of recommendations, a one-way video, two-way audio conferencing system was installed connecting JPL and Caltech primarily using one video channel and both broadcast audio channels on the microwave link. In its first year of experimentation, the system carried a series of live seminars from Caltech to JPL. The system was therefore referred to as the tele-seminar system.

This paper is an evaluation of the teleconferencing concept using the transmission of the JPL-Campus lecture series from a lecture hall at Caltech, to a conference room at JPL. This paper is an evaluation of this usage as a proof of concept system, for the school year 1978-1979. The system to be described is still in use at this time for the lecture series.

System Design

An Eye Toward Human Factors

Early in the design of the JPL-Caltech tele-seminar system, time was spent in anticipation of the needs of the potential users. The system was to be designed to work for the users, and not the other way around. Once again, the King of ID did his best to forewarn the designers with the following conversation:

> (A guard rushes into the king's majestic throne room, perspiration running from his face)
>
> GUARD: BAD NEWS SIRE! THE STABLE IS ON FIRE AND THE WIND IS BLOWING TOWARD THE CASTLE!
>
> KING: THAT'S bad news even WITHOUT the fire.[8]

To avoid systematic problems, a set of functional requirements were generated based on several basic premises. They were as follows:

1. The system should be operatorless[9]
2. The system should be non-intrusive
3. The speakers should not have to modify their lecture to accommodate the system
4. The system should be easy to use

System Layout

The resulting system was composed of a video camera located in a lecture hall at Caltech with television monitors and camera control equipment located in a conference room at JPL. Audio equipment, both transmit and receive, was located in both rooms. The lecture hall at Caltech had seating for Caltech students, staff and other persons wanting to attend in person. The conference room at JPL, being within a limited access facility, was basically for JPL personnel only. The system utilized video in one direction and audio in both directions.

System Components

1. The camera -- A single high gain monochrome camera (RCA Model TC 1005/N01C) was suspended, upside down, from the ceiling of the lecture hall at Caltech. The camera had tilt, pan and zoom servos. The camera was situated approximately three quarters of the distance back from the front of the room. Zoomed totally forward the field of view is approximately four square feet of the front blackboard. Zoomed totally back, the field of view was floor-to-ceiling showing the first two rows of seats.

2. Speakers -- Two speakers were wall mounted on either side of the lecture hall approximately one quarter of the distance back from the front. The speakers carried the voice signal from JPL. The lecture hall was small enough such that voice amplification of the lecturer was not required for persons in attendance at the lecture hall.

3. Microphones -- Two lavaliere microphones were provided for the speaker and one additional person. These microphones were used to transmit the voice signal to the extended audience situated at JPL. The output of the microphones was not normally monitored at Caltech. During the period of the evaluation only one of the microphones was used.

   Several surveillance microphones were suspended from the ceiling to pick up questions from those in the lecture hall at Caltech for the benefit of those in the extended audience at JPL. They did not work properly and were disconnected early in the lecture series.

4. System Status Lights -- Located on each side of the room were a small green and a small red light. The red light indicated whether or not the system was activated. The green light went on when a question was pending from the extended audience at JPL. This light was controlled by a circuit which slows the light's rise in luminescence. The color of the light and the circuit were selected so as to blunt the otherwise obtrusive nature of the light. All the status lights were easily visible throughout the lecture hall.

5. Campus Off Switch -- In the event of a drastic problem, the entire system could be shut down from the front of the lecture hall via a single switch. This also served to provide the lecturer with the privacy of limiting the audience to those physically present. The switch was not used.

6. Camera Control Panel -- As the system was intended to be operatorless, a small table top control panel was fabricated to be used in the conference room at JPL. The control panel uses individual toggle switches for camera tilt, pan and zoom. A master on/off switch is used to activate the entire system at both ends, except for the television monitors at JPL. A volume dial controls the volume of the voice signal coming in from the campus. Appropriate status lights indicate System On, JPL Disabled, Campus Disabled, and Question Pending.

7. Television Monitors -- Three 25-inch TV monitors were ceiling mounted on either side of the front of the conference room at JPL. These monitors were activated by a wall switch.

8. Speakers (JPL) -- Two speakers were wall mounted on the side of the conference room to carry the audio signal from Caltech.

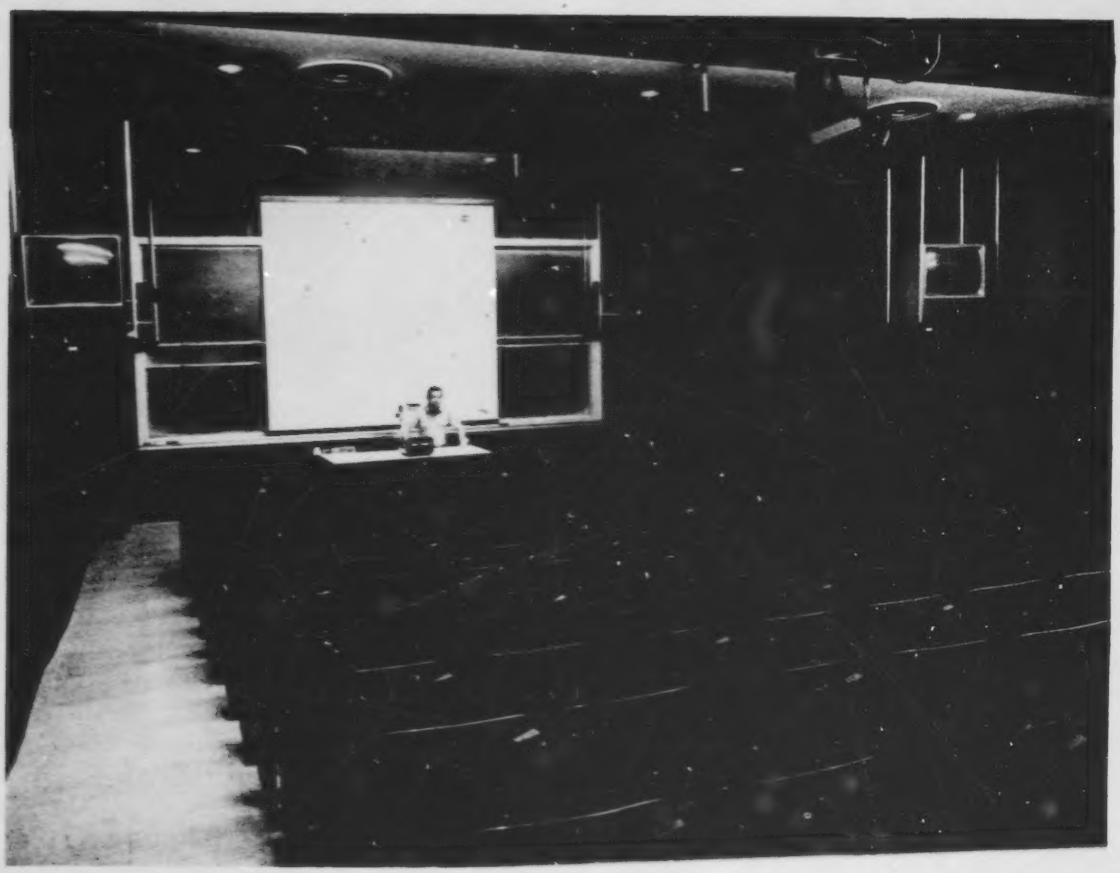
9. Telephones -- Three push-to-talk telephones were distributed around the conference room at JPL. One telephone was attached to the control panel by a ten-foot extension cord. Two other push-to-talk telephones were located on either side of the back of the conference room. They were attached to the control panel by 25-foot extension cords. The activate bar in the center of the handset was used to open the voice channel from JPL to Caltech and was kept depressed both while talking and listening. It also activated the question pending lights at Caltech.

An ordinary cradle telephone unit was incorporated into the control panel. This phone could be used to call any phone at JPL or Caltech. Conversations on it were not carried over the conferencing circuit. (An intercom system connected the two rooms and could be used in the event of system problems).

10. Frequency Shifter -- In order to accommodate truly interactive audio, the incoming voice signal is shifted up in the spectrum by 3 Hz (Altec frequency shifter model 1614A). The effect was not noticeable to the human ear, but feedback and signal clipping were totally eliminated. Feedback occurs when the voice signal sent is returned to the source via an incoming line. The effect is the earsplitting squeal common at high school assemblies. Signal clipping occurs when audio equipment is designed to eliminate feedback by allowing the audio signal to travel in only one direction at a time. In the JPL-Caltech system, this would have prevented a question from being raised at JPL while the lecturer is speaking.

A common method of approaching the solution to these problems is to allow the loudest signal to capture the line. Another is to reduce the amplitude of the second signal several decibels and allow it to be heard. Neither system is interactive and spontaneous comments are thus limited.

Using the frequency shifter, two or more people can speak at the same time at both the Caltech lecture hall and the JPL conference room and all can clearly hear what is being said.



1.

The Caltech lecture hall showing the television camera at the top right.
The television monitors shown were used for a purpose other than described in this paper.

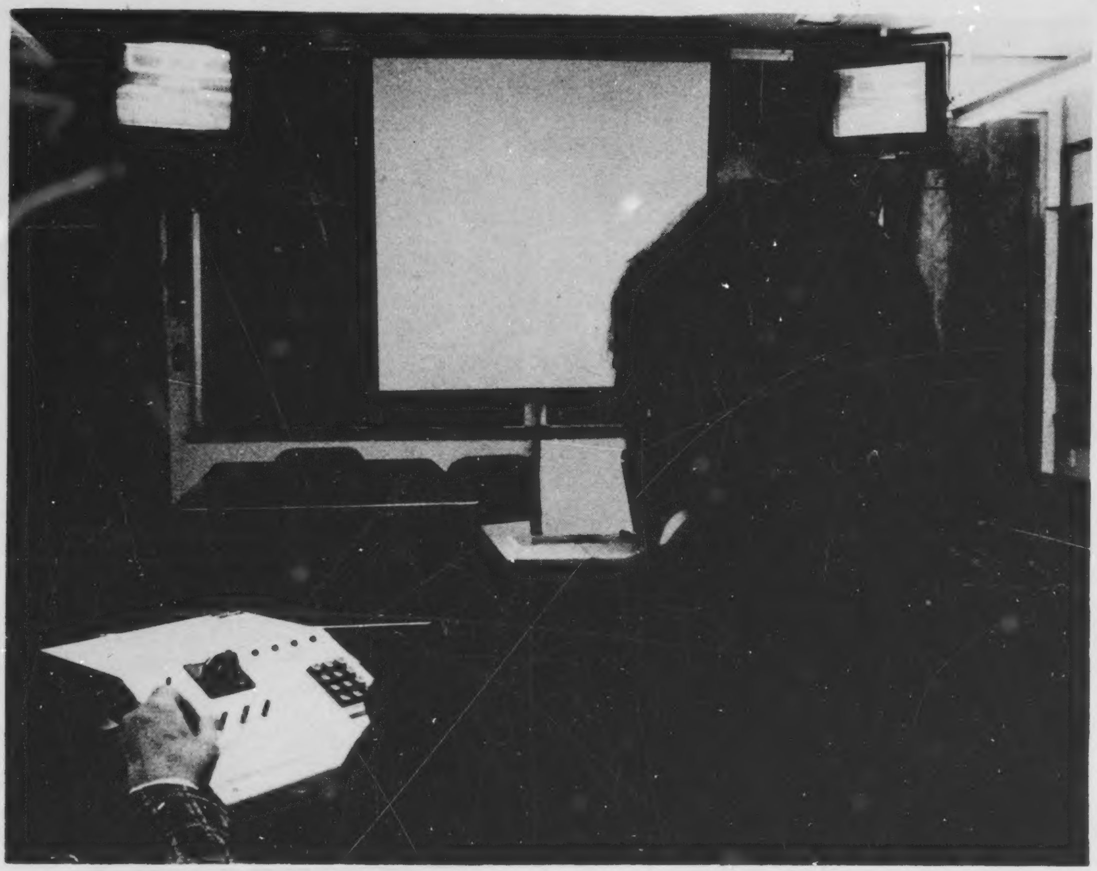
Orientation to Lecturers

An individual usually gave only one lecture in the series. Therefore, each lecturer was new to the system. In order to orient them to the equipment and the concept of a tele-seminar, a one and one-half page document was sent to each, approximately one week before their talk. The document primarily described the equipment used in the system and informed the lecturer about the microphone and the status lights. As the system was designed to cater to the lecturer and not the other way around, only minimal guidelines were given. Those guidelines are fully reproduced here.

> Guidelines for an effective in-person seminar prevail. If your presentation style has been effective for past seminars, it should be suited to a tele-seminar.
>
> a. Your policy on questions can be announced at the start of your presentation (hold questions until end, take questions as they arise, acknowledge questions from JPL when "question pending" light goes on, etc.)
>
> b. Visuals, props, or blackboard diagrams, if on for 30 seconds or longer, will allow those at JPL to tilt, pan, or zoom the television camera to see them.

The lecturer was also informed about the evaluation and the name and phone number of a contact person were given.

In addition to the one and one-half page document, a three-by-five index card was enclosed which summarized the system characteristics. The intention of the card was a kind of prompter card to be used just prior to the talk.



2.

The JPL conference room, showing the control panel and television monitors used for the series.

Just prior to the talk, the contact person would call the lecturer and offer to answer any questions regarding the tele-seminar. In some cases, the lecturer was interviewed after the talk as part of the evaluation.

System Operation

The system worked in the following manner. Prior to the start of a lecture, a JPL employee arrived early to set up the control panel and telephones around the conference room at JPL. Only one cable needed to be connected to the back of the panel. The switch was thrown on the control panel, the monitors turned on, and the system was totally activated at JPL and Caltech in approximately 60 seconds. When the extended audience arrived, any person could use the control panel. The lecturer appeared on the television monitors and was heard through the speakers. When a question or comment arose, a push-to-talk telephone was activated, otherwise those in attendance at Caltech could not hear the extended audience.

At Caltech, the system status lights indicated that the system was up and that someone was in attendence at JPL. As the program began, the lecturer was introduced via a lavaliere microphone which the lecturer wore during the hour long talk. In the lecture hall at Caltech, those physically present were aware of the presence of an extended audience via the status lights, the movement of the camera as it tilted, panned, or zoomed, and via the sound of questions and comments coming through the speakers on the walls.

In most cases, at the end of the lecture, questions were asked by both audiences. The questions from Caltech needed to be repeated by the lecturer into his microphone; otherwise they were not heard at JPL. After the lecture was over, the system was shut off from JPL and the loose components placed in a custom-made cabinet.

Evaluation Methodology

The evaluation data were collected through survey questionnaires and by personal observations made by the evaluators. The items on the questionnaires were based on the goals of the experimental conferencing system and the goals of the seminar series.

Goals

The overall goals of the experimental conferencing system were:

1) To act as a proof-of-concept/path finder system to find technical road blocks,
2) To serve JPL employees who could not attend the JPL-Campus lecture series, and
3) To bring JPL and Caltech closer together.

The overall goals of the lecture series were elaborated as follows:

1) To increase communication between JPL and Caltech, and
2) To provide an educational forum for the exchange of technical information.

The evaluation was an examination of the achievement of these goals. The actual lecturers, lecture material, and presentation style were not evaluated.

Personal Observations

For each seminar, at least one evaluator was present at either the JPL or Caltech end. At times one evaluator was present at each end. At the end of the seminar, observations were written down in note form to be compiled at the end of the series.

Survey Questionnaire

As a partial measure of the attainment of the goals, two attitudinal survey questionnaires were designed. One was directed at those in the extended audience at JPL and one at those in the lecture hall audience at Caltech. Those at JPL were asked to respond to questions pertaining to:

- the purpose of the lecture series
- their reason for using the tele-seminar system
- the equipment
- signal quality
- their interaction with the lecturer
- general comments
- personal commuting information

Those who attended at Caltech were asked to respond to questions pertaining to:

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- the purpose of the lecture series
- the equipment
- the extended audience
- general comments

Survey Population and Sample

All attendees were asked to fill out a questionnaire, even if they had previously attended and filled one out. Not all attending did so. At one talk, due to a lack of evaluation personnel, questionnaires were not distributed.

The tele-seminar system was operational for a half-dozen lectures during the 1978-1979 school year. Attendence at JPL averaged 15 to 20 JPL employees. Attendance at Caltech averaged 40 to 50 students and Caltech or JPL staff.

Evaluation Results

Prior to elaborating the results from the survey questionnaires filled out by the attendees, it is important to discuss that which the evaluators saw as observers.

The Equipment Performance

The overwhelming successes were the performance of the camera in accommodating changes in light levels, and the frequency shifter in supplying clear interactive audio signals. As a test of the shifter, personnel were able to count simultaneously at both sites into a microphone and a telephone, and hear each other's count uninterrupted.

As with any pathfinder system, there were failures. On one occasion, the microwave system itself failed. The surveillance microphones needed to be disconnected when they failed to function properly, stray noises occasionally came through the spearkers and the tilt, pan, and zoom servos gave an audible whine heard in about one third of the rows in the Caltech lecture hall. The greatest problem was a delay between the issuance of a command from the control panel at JPL and its electro-mechanical response at Caltech. The delay was caused by using the supporting hardware beyond their specifications. In some cases the question pending light would not go on, or would be activated after the lecturer had gone on to another subject. Another manifestation of the signal delay problem was that fine adjustments to the camera were impossible. For example as the camera was zoomed forward, it the item of interest was not centered, the person operating the control panel could only zoom the camera back, giving less resolution, and therefore less detail.

The system did not operate well without an operator. Participants rarely took it on their own to operate the system, and one of the system designers became a de facto operator. Even when invited to use the control panel, most turned him down.

Adaptation of the Lecturers

In most cases, the lecturers reported almost forgetting about the JPL audience. This became a problem. The question pending light (when activated) was ignored and JPL employees would have to break in and ask questions while the lecturer was speaking. This was partially due to the fact that at least four of the six lecturers failed to announce their question and answer policy at the beginning of the lecture and to the delay in the control signals from JPL. In some cases the lecturer would switch between a blackboard diagram and a viewgraph before the JPL viewers could move the camera, causing a loss of information to them.

JPL-Caltech Interactions

The JPL-campus lecture series, having existence prior to the tele-lecture experiment had created its own formal procedures as well as its own informal social structure. One such structure was the coffee klatch prior to the lecture. Here the lecture series coordinator, who is on the faculty of the Caltech Electrical Engineering Department and also an employee of JPL, acted as host and introduced the speaker to persons attending the lecture. The effect was to spinoff several small group discussions, many between persons jointly being introduced to the lecturer, and some between the lecturer and individual attendees. Prior to the lecture series, approximately 25% of the attendees were JPL employees. After the start of the series, the proportion of JPL employees attending in person, remained about the same and therefore these face-to-face interactions continued.

Another informal social structure was the conversation in the bar after the lecture. Once again, the coordinator invited those in attendance to join him and the lecturer for free beer across the street for a half an hour or so. This structure provided a valuable means of providing interaction. By observation, the number of JPL employees going along seemed to stay the same, even after the introduction of the tele-seminar system.

Survey Results -- Audience at JPL

A total of 45 questionnaires, completed by JPL employees using the system from the JPL site, were used in the analysis. An additional five questionnaires, from persons who reported using the system more than once, and who had previously filled out a questionnaire, were deleted from the analysis due to the small sample size. Observers felt that most repeat users of the system simply did not fill out additional questionnaires. Therefore, no inference should be drawn from the small number of reported repeat users.

The results will be summarized with only major findings being elaborated.

1. Logistics -- Most respondents became aware of the particular seminar and the tele-seminar room via an official JPL meeting notice. Very few reported sitting near or using the control panel. The majority stayed in the room for most of the seminar.

2. Purpose of the Series -- In assigning priorities to possible purposes of the seminar series, the group as a whole assigned the highest priority to "... provide technical and scientific information....", and the next highest "To improve communications between JPL and Caltech."

3. Reason for using the room -- In assigning priorities to reasons for using the tele-seminar room, the group gave the highest priorities to reasons having to do with time and convenience. The possibility of getting a better view, by using the video system, was given a very low priority.

4. Control Panel/Ease of Use -- Very few respondents reported using the control panel, and therefore no conclusions could be drawn from their limited attitudinal responses.

5. System Signal Quality -- Overall, the respondents did not rate the quality of the video very highly. In each case, in evaluating the quality for the lecturer, visuals/props and the blackboard, the group rated it as only "all right." The audio quality of the lecturer was rated between good and very good. The audio quality of the question asked at Caltech was rated as being poor. This was due to the initial sessions using the surveillance microphones and to the neglect at Caltech in repeating questions asked off-mike into a microphone.

6. Interaction with the Lecturer -- About one-half of the respondents stated that they had ".. met or spoken to the lecturer prior to (the) lecture." About one in every seven reported asking questions over the system. Almost all who asked or heard questions being asked, felt the questions were "immediately acknowledged and answered", and furthermore they felt that the questions were understood by the lecturer.

7. General Comments - There were two comments stated by many respondents. They had difficulty reading the viewgraphs over the link and they wanted color video.

Survey Results -- Audience at Caltech

In surveying the attendees at the Caltech lecture hall, a sufficient number of respondents were identified as repeat visitors to allow them to be included in the analysis as a distinct group. Fifty-eight (58) respondents indicated their first time use of the system. An additional 26 identified themselves as repeat visitors to the series, while the tele-seminar experiment was being conducted. The results are summarized below, with any differences between the two groups noted.

1. Attendance -- In both groups, Caltech students made up over 75% of those in attendance. The remainder (other than occasional outside visitors) were JPL employees. The repeat group was more highly populated by Caltech students, a portion of whom worked part time at JPL. The majority of both groups became aware of the meeting through a written notice. Over a third of the first time visitors reported hearing of it from someone else, possibly the coordinator, acting in his role as visiting professor.

2. Purpose of Series -- Both the first time and repeat visitors agreed with the respondents from the JPL conference room on the purpose of the series. The highest priority was given to the series acting as a technical forum, followed by its functioning "To improve communications between Caltech and JPL." Possibly because of the abundance of students attending at Caltech, "to provide an additional or special lecture for the students..." was rated as highly as the improvement of communication.

3. Reason for Using the Room -- Both the group as a whole at Caltech, and specifically the JPL employees attending at Caltech were asked to rank reasons why the "extended audience" chose to stay at JPL and use the tele-seminar system. This was done to see if the perceptions of those at Caltech matched the attitudes of those at JPL. A discrepancy could have indicated poor communication or hostility between the two groups. In all but one case, there was total agreement among all three groups. Only the repeat visitors to Caltech seemed to play down the possibility that those staying at JPL "...couldn't take the time to come to Caltech." This seemed to indicate that if the repeat users were taking the time to attend the lecture, so could those at JPL.

4. Reason for Not Using Tele-Seminar Room at JPL -- The JPL employees in attendance at Caltech were asked why they came down to Caltech instead of using the tele-seminar room. Valid comparisons could not be made between the JPL and Caltech personnel because of small sample sizes. Overall, the JPL employees gave much higher priorities to items measuring use of the informal social structures and face to face communications, than they did to items measuring convenience.

5. Equipment Performance -- About 15% of the first time group reported the equipment as distracting or disruptive, while nearly 70% of the repeat users did. Possibly the first time users chose to ignore problems in the "experimental" system, while repeat visitors grew more annoyed with the problems. Both groups reported almost always understanding the questions asked over the system from JPL.

6. General Comments -- Several people indicated annoyance with the static in the speakers (later corrected as a bad patch cord). Some suggested two-way video, possibly for seminars going in both directions.

Correlation Analysis

In the case of the data gathered at JPL, the sample sizes were large enough for a series of nominal and rank order correlation tests to be performed. Some interesting relationships appeared.

Upon examining the relationships between acquaintance with the lecturer and assignment of priorities to different purposes of the series, an interesting and statistically significant pattern was found. Those acquainted with the lecturer were more likely to assign a higher priority to improving communication between JPL and Caltech than those not acquainted with the lecturer. Yet the opposite was true in assigning a high priority to the purpose of the lecture series being to provide a technical forum. Those acquainted with the lecturer were less likely to assign their top priority to it than those not acquainted. This seems to indicate that two distinct groups of viewers were in attendance, those going in support of or to see the specific speaker and those going to gain technical information.

In an examination of another purpose for the series, some evidence was found to indicate the longer JPL employees felt it took to drive to Caltech, the more likely they were to assign a higher priority to "...a special lecture for the Caltech students...". This seemed to indicate a degree of displaced inconvenience. The further the drive, the greater the inconvenience to JPL employees, and the greater the probability in thinking the lecture series was really for those at Caltech.

Conclusions and Recommendations

Conclusions -- Goals of Experiment

1. Technical Roadblocks -- The tele-seminar system did serve to eliminate technical roadblocks in the path of video conferencing between JPL and Caltech. Video can be transmitted from Caltech to JPL via microwave, and therefore no problems should be anticipated in expanding to both directions. Clear

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interactive audio appears to have no roadblocks between the two locations. Expansion to multiple rooms at either or both sites could have technical roadblocks as additional hardware would need to be added, introducing unknowns into the system.

The operatorless control equipment caused serious system problems. These problems possibly caused the JPL users to perceive the quality of the video to be lower than it actually was.

2. Serve JPL Employees -- The system did assist JPL employees in attending the lecture series. As time did not permit in-depth interviews of JPL attendees, one cannot be sure if those using the system would have otherwise attended the lectures at Caltech. As an oversight this was not asked on the questionnaire, yet the questionnaire results did indicate that the JPL employees liked the convenience.

3. Bring JPL and Caltech Closer Together and Increase Communication -- The close correlation (non-statistical) between the responses given to questionnaire items at Caltech and JPL indicated, at least, that those attending at either end did not consider themselves to be apart. A thorough investigation of the attainment of this goal would have required evaluation techniques beyond the resources of this study. By observation, the face-to-face contact between JPL and Caltech personnel at Caltech did seem to provide an atmosphere conducive to the attainment and maintenance of a close relationship between the two institutions.

   The communication between the two organizations is increased by the seminar series itself and the informal social structures built through the work of the coordinator.

Conclusions -- Meeting of Functional Requirements

1. Operatorless System -- The system did not function as being operatorless. Possibly because of initial operation by personnel connected with the system, a pattern was set such that they became de facto operators.

2. Non-Intrusive System -- The system was non-intrusive from the standpoint of the lecturer, but intrusive from the standpoint of repeat attendees at Caltech. As the audience had a tendency to sit away from the front of the room, where the lecturer stood, they were closer to the system components which were occasionally intrusive due to audible noise.

3. Lecture Style -- The system does require a modification of lecture style or at least some practice with the system. It is unreasonable to assume otherwise. Because new lecturers are an aspect of the series, avoiding changes in lecture style would imply the requirement for greater flexibility in the tele-seminar system, more cameras and possibly someone delegated to select cameras (blackboard, viewgraph, lecturer, etc.) It might even require individual camera operators.

4. Ease of Use -- The system was designed to be easy to use. The control panel was well laid out and the overall system was easy to activate at both ends. Yet the ease of use was overshadowed by the signal delay problems between the control panel and the electro-mechanical responses at Caltech.

Recommendations -- Short Term

1. Procedures -- More time needs to be spent orienting new lecturers to the system. A loss of information due to nonstandarized delivery formats need not occur. Minor standards, such as a uniform question and answer policy stated at the beginning of each talk and the display of all information via an overhead projector would help considerably.

   Within the existing system, questions raised at Caltech can not be heard at JPL. One solution is for the series coordinator to use the second microphone and, as a procedure, always repeat questions raised at Caltech. This would circumvent hardware solutions or the need to continually remind different lecturers to repeat the questions into their microphones. This is suggested, as surveillance microphones will always provide poor quality audio in the present lecture hall. Other hardware solutions require an audio operator or "sound man".

2. Equipment -- The signal delay problem in the control panel needs to be solved if the system is to remain without a camera

operator. Whether the de facto operators continue to handle the control panel or others attending at JPL do so, this problem will tarnish an otherwise acceptable system. In the short term, an easy to follow flip book of operational procedures would help make attendees into operators.

Recommendations -- Long Term

Plans should be made on how to split usage into video conferencing experiments and operational institutional programs between JPL and Caltech. It should be recognized that there is a limit to the institutional usage of a video conferencing link between two institutions less than 10 miles apart. In many cases, the amount of time spent in traveling from one's office to a central conferencing room could equal the time spent in travel by direct shuttle. Logistics, such as shuttle departure point and schedule versus location and availability of a video channel, will eventually balance out. Yet, there is much less of a limit to the potential of video teleconferencing used on a national or international basis, particularly if sophisticated audio and data channels are incorporated into the package. JPL and Caltech should use the link for experimental teleconferencing, the results to be used as operational teleconferencing systems and procedures with their customers. Additionally, in light of the pending catapulting of teleconferencing into a satellite era, many commercial users will be making great capital outlay for technologically advanced communication systems with no guidelines for procedures as to how to use them effectively.

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9 Operatorless is used here to mean "not requiring a full-time operator". The control panel, to be described later in this paper, required someone's attention during the seminars.

PUBLIC INVOLVEMENT IN THE LEGISLATIVE PROCESS THROUGH TELECONFERENCING
THE ALASKA EXPERIENCE

Sioux Plummer
Teleconference Coordinator
Legislative Affairs Agency
Division of Public Services
State of Alaska
Juneau, Alaska

It is impossible to talk about the effects of teleconferencing on the legislative process without first describing the stage and the players. Environment, geography, cultural and educational differences, accessibility to comforts, transportation and means of subsistance are all factors of impact to the technology of a teleconference system such as the Alaska State Legislative Network.

There have been previous reports to this one, describing in detail the origination of Alaska's system and technical detail regarding its components.[1] This paper will touch briefly on the history and development of the network; emphasis will be given to impact and results since its inception.

The Legislative Teleconference Network, herein referred to as the LTN, is now in its third year of operation. Most significant at this time is the impact teleconferencing has had on the whole legislative process. By legislative process we mean the passage of bills and generally expanding information and communication of all kinds relating to the workings of state government. We in Alaska have found the effects of teleconferencing to not only be an interesting phenomenon, but one which provides very legitimate and profound results.

Setting the Scene

Some people are very aware of the "uniqueness" of the State of Alaska, more are not. For the sake of clarity, and to best understand the causes of some effects of teleconferencing on the Alaskan legislative process, it is important to set the stage and make note of the total environment.

Picture, if you will, a state twice the size of Texas with a total population less than that of Omaha, Nebraska. It is a state of vast extremes: the largest in land area and the smallest in population; it is first in income per person, yet has the least amount of electric power available than any other state.

Alaska is a land of extreme weather conditions, some not uncommon to other states with its limited access to the comforts that lessen the effects of those extremes. Alaska has impassable mountain ranges, plus it boasts the nation's highest mountain, Mt. McKinley. It has desert-like areas where nothing grows; it has more coastline than all the other states combined and fewer roads and highways than probably all of Madison, Wisconsin.

Varieties of people make Alaska culturally interesting and cause communication concerns. We are a state of mostly Eskimo, Aleut and Indian natives, interspersed by Caucasions throughout. Our people are aboriginal types to university-educated; some reside in small villages and fish camps while others live in sophisticated urban centers much like cities in the "lower 48". Transportation for some is dog sled and more recently, snow machine. Many people have 4-wheel drive jeeps or cars, while others find the standard, modern automobile perfectly suitable.

Highways are limited due to great distances between urban centers and difficult terrain. Juneau, the capitol, completely lacks a highway out of the city to anywhere--it is land-locked and relies on the Alaska Marine Highway (the ferry system) and daily commercial jet flights. Roughly 75% of the state's residents are concentrated in a dozen or so communities, many of which are primarily, or solely, accessible by air. There is a small railroad, but light aircraft serves the bulk of the state's transportation needs, and often, on a sporadic basis.

The scene and environment for legislative teleconferencing is now set. We can see then, the need to communicate with varieties of peoples, over vast distances, often with detrimental weather conditions, and regarding subject matter that can vary greatly in importance from region to region.

A Need is Defined

Obviously, legislators need to talk to their constituents and the citizenry needs access to their elected representatives. There are definitely some basic constraints involved with trying to do just this. A classic example is Mr. Citizen in Bethel, Alaska wishing to "testify" at a public hearing to be held by a legislator and his/her committee in Juneau. Without a teleconference system, Mr. Citizen has two options in order to be heard by his legislator--he can write a letter or get on an airplane and fly to Juneau. Mr. Citizen is a fisherman by trade and the committee hearing is on legislation greatly effecting his region, business and life. He WANTS to be heard! Previous to the accessibility of teleconferencing, he probably would not have been heard. Either lack of time or money for travel to the Capitol would no doubt have prevented his presence at the hearing. And, not being one to write letters, much less to an "important" official, he probably won't get his concerns down on paper and in the mail to his legislator. Anyway, he fears that his letter will be lost in the "bureaucratic shuffle", so what's the use?

So we have, in simple terms, defined the need. In 1977, the Alaska State Legislature made note of this need and decided to tackle the problem. Legislative Resolve 93 established the LTN Task Force, assigned to research, develop and recommend a suitable system, one which would be administered by the Legislative Affairs Agency.

This was not a simple task. Had this group represented the legislature in Washington, for example, (the nearest state to them) the story would be quite different. Keep in mind that Alaska only became a state in 1959. Modern telecommunications, let alone the relatively new technology of teleconferencing, was not exactly the by-word in those days. Great strides have taken place in twenty years, however, and the past decade has shown change in the basic MTS telephone network from a military owned and operated communications system to modern satellite and earth station use.

The development of a teleconference network was a very new thought though, and by the time the deed was done, those involved--consultants, legislators, coordinators, and the one and only long lines carrier in the state, RCA (now known as Alascom, Inc.), all became well-versed in the factors of teleconferencing, but more particularly, in just trying to communicate with each other. Previous reports and history of the development of the network clearly indicates there were difficulties in the beginning and throughout the project.[2] RCA was asked to provide technology and service they really had not dealt with before, and the task force was essentially a group of interested experts, but none of whom had ever been directly involved in such a project either.

System Description

The task force did indeed accomplish their assignment, and by December 1977 the order for a dedicated, 4-wire leased circuit was given to RCA. The circuit was to be full-time and linked to six communities: Anchorage, Fairbanks, Juneau, Nome, Ketchikan and Bethel. (See map attached) The circuit was also to provide facsimile transmission capability.

By February of 1978 the system was in place as ordered. The sites became "teleconference centers", with the coordinator's office located in Juneau. Scheduling and direction came from Juneau, as did the origination of most hearings or meetings that were teleconferenced. The following September, Washington, D.C. was included on the circuit. The Washington offices of our two U.S. Senators were added, as well as the Office of the Governor. This afforded tremendous scope to the network and has helped bring certain issues and priorities of state government closer to federal government.

The RCA/Alascom-provided circuit terminates in local telephone company facilities in each community, none of which, incidentally, are the same company. As the long lines carrier, Alascom is required to coordinate and be responsible for the inter-connection to each of these separate independent telephone companies. (None are Bell affiliated, some are small cooperatives and others are municipal utilities.) The telephone companies extend the circuit through their own cable facilities from Alascom's earth stations or toll centers to the office where the teleconference equipment is located, terminating into a standard, modular jack. At that point, we take modular cord in hand, and conveniently plug our portable equipment into the circuit.

The conference equipment, simply operated, is a WE50 A1 conference set, which comes equipped with two small mikes and an enclosed set mike. It looks much like a speaker telephone. Since the circuit is dedicated, the hand-set on the conference equipment is not utilized for dialing--ours is not a "dial-up" network. It is "on" 24 hours a day; the only way one can "delete" a site from access to the system is to merely turn the conference set off.

The set is compatible to other types of microphones, in particular, push-to-talk Darome mikes are conveniently used, as are Shures in conjunction with mixers for use with many participants, such as for a large committee in a Capitol hearing room.

The System Today

Since its inception, the network has grown, both in terms of where the circuit goes and by its increase in use. Now, it extends beyond the six original communities and presently includes Sitka, Dillingham, Wasilla, Valdez, Kotzebue, Kenai Peninsula and Barrow. (see map attached)

Valdez is the only site that is commonly referred to as a "teleconference center", because it strictly offers access for teleconference participation. All other sites have evolved into full-fledged Legislative Information Offices, offering not only telecopy services via the LTN (sometimes to all sites at once!), but other information services and communications devices such as computer-based data terminals providing instant access to bill history and the convenience of electronic mail. Three of the original sites were already providing legislative information to their communities, but it is fair to say that the development of the LTN contributed to the entire progression of the other locations.

Needless to say, with direct access to the Capitol from thirteen Alaskan communities plus Washington, D.C. and visa-versa, communication has increased dramatically state-wide. There are now few remote locations in the state that cannot readily reach a teleconference facility and have a voice in state government.

Today we conduct three to five teleconferences almost daily, sometimes back to back. Most are public hearings, and quite often, are conducted to include all sites on the network, excepting Washington, D.C. Some are more regionalized, or are scheduled to include only those sites that share the same time zone. (Besides the vastness of the network, we deal with four time zones in the state. Scheduling is indeed a challenge!)

Since the most frequent use of the network is legislative and for the primary purpose of teleconferencing public hearings, the capitol complex in Juneau has many drops, that is, modular jacks, connected to the circuit. These drops are located in fourteen committee rooms in the capitol and two adjoining buildings thus affording committees the convenience of conducting hearings comfortably from their own turf. This is appreciated, as it prevents legislators and staff from having to carry their prepared materials and files to a central teleconference room. Instead, the teleconference staff wheels the portable equipment on a cart up elevators, down halls and across the street, much to the delight of each committee.

Additional drops are located in the Legislative Affairs Executive Director's office and in the Teleconference Coordinator's and Legislative Information offices, all in the Capitol building. Occasionally, small teleconferences are held right in the coordinator's office where equipment is permanently connected to the circuit. Each field office has one to three drops and there are drops in locations specifically used for video conferencing which will be discussed later in this paper.

Procedures and Protocols

One of the Task Force's original concerns was to prevent the "technology" of teleconferencing from interrupting or interferring with the formal public hearing. Definite procedural protocols and understandings had to be established and adhered to by the users from the very beginning.

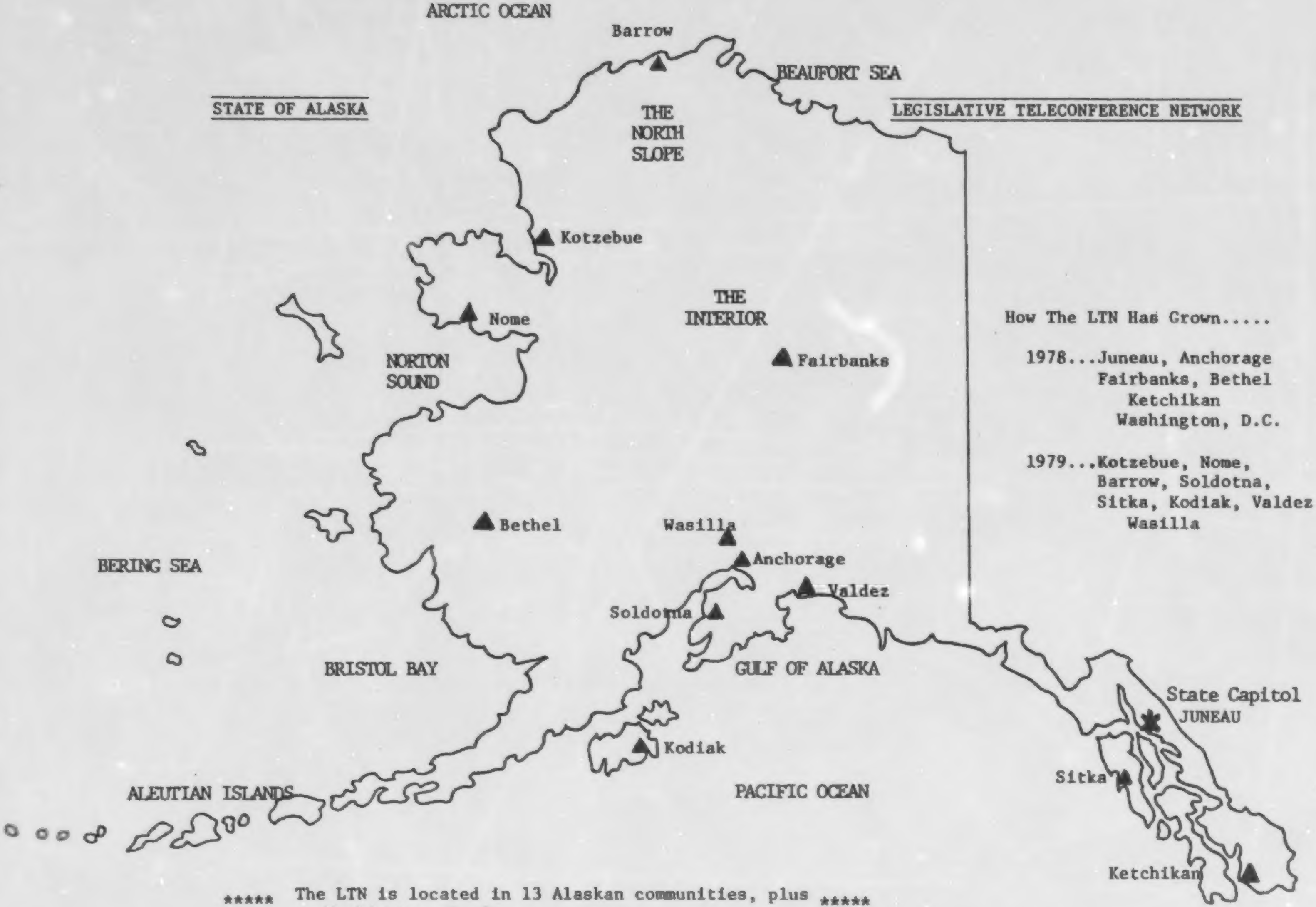
This has been quite successfully achieved by basically following the routine "Robert's Rules of Order" format, as done in face to face meetings. Each teleconference site is staffed by a "moderator", who is in charge of equipment, plus acts as an extension to the chairman of the teleconferenced meeting. Probably the most effective protocol is the fact that the chairman does indeed "control" his/her own meeting or hearing. The moderator assists by polling sites, preparing those on the network for the chairman's call to order, and sharing or receiving any pertinent pre-meeting information with the other moderators. The moderator remains present throughout the entire teleconference, adjusting equipment occasionally, assisting with witnesses present and responding to needs of the chairman. At the close of each teleconference, the moderators "sign-off" from their locations and remove the equipment from the committee room in the capitol and make necessary rearrangements, if any, in the field offices. In case of line noise or any technical disturbance, it is the duty of the Juneau-based moderator to report the trouble to Alascom repair. The moderator is also responsible for familiarizing witnesses and observers with equiment and protocols before each teleconference.

Moderators often have dual roles in their offices, as they also act as legislative information officers. They have on hand copies of bills and other documentation as back-up materials for given teleconferences. On short notice, a committee may telecopy additional information just prior to a teleconference, which is an added advantage to all concerned.

Alaska's teleconferencing and information falls under the auspices of the Legislative

STATE OF ALASKA

LEGISLATIVE TELECONFERENCE NETWORK


ARCTIC OCEAN
Barrow
BEAUFORT SEA
THE NORTH SLOPE
Kotzebue
Nome
NORTON SOUND
THE INTERIOR
Fairbanks
Bethel
Wasilla
Anchorage
Valdez
Soldotna
BERING SEA
BRISTOL BAY
GULF OF ALASKA
State Capitol
JUNEAU
Kodiak
Sitka
ALEUTIAN ISLANDS
PACIFIC OCEAN
Ketchikan

How The LTN Has Grown.....

1978...Juneau, Anchorage
Fairbanks, Bethel
Ketchikan
Washington, D.C.

1979...Kotzebue, Nome,
Barrow, Soldotna,
Sitka, Kodiak, Valdez
Wasilla

***** The LTN is located in 13 Alaskan communities, plus ***** Washington, D. C.

Affairs Agency's Division of Public Services. That Division provides employee orientation either in Juneau or Anchorage prior to each legislative session, which begins January of each year and runs approximately five months. During this orientation, equipment and protocol training is provided, plus the very positive factor of moderators meeting and sharing problems and experiences.

A moderator's "how to" handbook and a teleconference "user's guide" was developed this year to supplement training and to answer ongoing user queries.

A very important facet of involving the public in state government through teleconferencing is publicity. Access to the media varies from community to community, as does success at reaching constituents. Publicity protocol requires that legislative committees advertise and promote their own public hearings. However, we again act as extensions of the committee whenever possible, by our moderators displaying posters in their offices, having up-to-date schedules on hand, and by following up with public service announcements to local radio, T.V., or newspaper sources in their own communities.

Other Users

The LTN is not solely used by the Legislature. The original legislative mandate included offering the network to other users on a priority basis, and only when it is not in use by the Legislature. The eligible users, in order of priority are:

Legislative Affairs Agency
Executive and Judicial Branches
Other State Agencies
Non-profit Organizations

During the legislative session, most teleconferences are legislative. However, when space is available, other state agencies, in particular, find space on the network, as do non-profit organizations such as health agencies. One particularly successful teleconference was presented by the Governor's Commission on the Status of Women; post-hearing reports indicate topics and individuals were represented for the first time that could not have participated without access to the LTN. Another successful non-legislative program is an all-day workshop on Sudden Infant Death Syndrome, presented by the State Department of Health and Social Services.

During the interim, there is more time available for non-legislative use, although permanent legislative committees do continue to utilize the LTN. Because the information offices are not staffed year around, we do on occassion charge a small fee to non-legislative users. This helps to cover costs for keeping a moderator "on-call" at those locations. Otherwise, regular funding continues to cover LTN costs.

Non-legislative requests are accepted at the user's "risk"; that is, a legislator can pre-empt something previously scheduled on 24 hour's notice. This rarely occurs; with careful tracking and constant updating of schedules, we seem to accommodate most everyone.

With frequent teleconferences, reliable personnel becomes essential. Most locations need at least one part-time back-up to the regular employee. During session, Juneau requires two full-time moderators plus a part-time person who primarily handles evening teleconferences. Anchorage has a similar setup.

A regular and vital use of the network is by the Division of Public Services for administrative purposes. We conduct daily "chatter" to all offices whenever possible for schedule updates, advice on problems (such as mail service and faulty data terminals, etc.), and exchange of bill and other legislative-related information. "Conference calls" are regularly held by the teleconference coordinator or another administrator to gather all sites together for pertinent news, comments, and quite often, just for the sake of good morale for all. The LTN is a distinct asset in keeping such an extensive chain of offices in touch with one another and with the agency's administration.

Video Teleconferencing

In 1978, funds were set aside to provide the opportunity for twelve two-way video conferences, in addition to the already established audio-only system.[3] Video conferencing is considered part of the LTN, but with some different aspects that require it to be presented as a separate subject.

Whereas audio-only teleconferencing is provided via an in-place circuit at permanent locations, video conferencing differs greatly. It is not a "system" that can be quickly utilized and easily scheduled.

To develop full-motion, two-way video capability, the task force went to considerable effort. A great deal of time and understanding of the concept, technology and requirements were spent by consultants and again, RCA/Alascom. In another innovative move to advance telecommunications throughout the state, once again the Alaska legislature's requirements resulted in expansion of the state's telephone utility, particularly in the area of satellite and microwave development.

The final outcome was an agreement with Alascom that allows use of their earth stations up to twelve times in a twelve-month period for $123,000 per year, and stretched over a five-year period. This fee is to pay Alascom for installing the necessary equipment at their terminals to allow two-way video. The thirteen and subsequent conferences in a given twelve-month period will cost only $1,400 per. The first "year" of the agreement began June 18, 1979.

Nine locations can participate in video productions; seven are two-way and two are receive only. The state's leased Satellite T.V. Demonstration Project transponder is utilized, plus a video "window" is regularly scheduled for two hours each week with the Alaska Public Broadcast Commission, which administers satellite programming.

The Last Mile

While the agreement with Alascom established "long line" video transmission, establishing termination facilities in each community was not quite as simple. Small information offices are not T.V. studios! As it stands, local T.V. facilities in private cable companies, college studios, and in two cases, the offices themselves, are secured for each video conference, and at expense beyond the basic $123,000. These "last mile" arrangements were at first cumbersome and inefficient. We are finding now, however, after five video presentations thus far in 1980, a more definitive procedure has resulted. This is in part due to coordination and production assistance by the Legislative Affairs Agency's new Media Center and also because video teleconferencing just became a "comfortable medium" this year. For a variety of reasons, some technical, most people-related, video teleconferencing did not get fully tested nor utilized in 1978/79. We do feel now that we have demonstrated video teleconferencing as a viable entity and fully expect to continue with more video productions through the remainder of the 1980 session.

Different From Audio

Video differs from audio-only in many respects, but most obviously by the addition of faces and graphics. While audioconferencing is probably unequaled as an inexpensive way to hear extensive testimony, video conferences speak to a different need.[4] Video adds more personality and "color"--it gives an intimacy not always established by voice-only.

Video conferences were fairly well-suited to the medium this year. One was a demonstration of equipment where a picture was essential to understanding, another was a presentation on telecommunications by a reknown guest speaker and the others were on the emotional and popular issue of Alaska's Permanent Fund (the state's oil reserve monies).

Assessments

To date, how do we feel about the LTN and our video endeavors? For the audio-only system, we are comfortable and pleased with a network that works well, is showing results by its increased popularity and improved access, and by and large, is not technically troublesome or difficult to maintain and operate. 1979 Session use of the LTN nearly doubled since 1978 despite the fact that the 1979 session was considerably shorter than the previous one. Three to four teleconferences were held most days, that has frequently increased to five. This increase can be attributed primarily to greater public awareness of the LTN's effectiveness, growing acceptance by legislative users, larger number of communities served and its suitability in dealing with the unique problems presented by the necessity of considering "sunset" legislation.

There is no way to truly evaluate this impact we speak of or measure the effect of citizen participation in the legislative process, we can only vouch for its existance. Judy B. Rosener, from the University of California, states, "...there is little agreement among and between citizens and administrators as to their goals and objectives". She and others agree there is little known about the "effectiveness" of citizen participation.

We base our positive feelings on the mere fact that more people than ever before are dealing direct with the legislative process; they are indeed becoming part of it. And, Alaskan legislators can represent their districts more realistically through teleconferencing. Weekly and monthly "constituent" meetings are now regularly held by legislators in Juneau, where they conduct evening talks about local problems with their constituents back home. This positive impact is further reinforced by the fact that all this is cost-effective; the process is expanding while costs for travel and time spent are lessened considerably.

Because video conferencing seems yet to be completely demonstrated, we are hesitant to make absolute judgement. And, whether or not the expense justifies the means over audio teleconferencing has not yet been fully reached and evaluated. With present staffing and facilities, plus the popularity of audio conferencing, suffice it to say we are generally pleased that our agreement limits us to twelve videos per year. On the other hand, the rate of success thus far has been good, and we have proven video conferencing can indeed be done, and with professional integrity.

Future Plans

Our assessment indicates we are generally satisfied with the LTN. Naturally, nothing is ever perfect, and even great ideas can be improved upon. With that in mind, and due to user comments and requests, we continue to research improved equipment, options and ideas.

One feature the original system is lacking is signalling. Since we do not have a dial-up network, there is no means to "call" a site that has the conference set turned off. Our one failure of note was an attempt to contract the construction of signalling devices, which was done with poor results. Not all the "decoders" worked, and those that did, failed rapidly.

Due to their own preference, the Washington, D.C. offices keep their sets turned off most of the time, which is understandable due to the time zone difference and no real need to "chatter" with Juneau on a daily basis. But, on occasion, there is need to reach those offices, and placing a long-distance call to Washington, D.C. to ask for the set to be turned on does seem ludicrous.

We also have infrequent need for "off-net" capability, that would allow access to 2-wire telephones via our 4-wire system. In particular, certain issues or legislation make including a remote village desirable, where otherwise a permanent LTN drop is unnecessary.

Certain problems will always exist in any telecommunications system, no matter how simple or complex. Our basic system is technically a simple design. It becomes more complicated to maintain and trouble-shoot when you consider it connects via satellite, earth station and terrestial carrier, and terminates into various local telephone company facilities. Because this system grew rapidly beyond the original expectations some "make-do" practices have resulted here and there, thus resulting in a particular problem which was lack of enough battery power for five sites to send (only) telecopy via the network.[7]

Alascom originally provided this "talk battery" at their toll centers, but no longer does this. So, we are required to supply this to our customer-owned equipment. This becomes complicated due to our also owning separate 500-style (single line) telephone sets, modified to 4-wire, for the explicit purpose of telecopying over the network. The reason for the extra phones is that the "Trimline"-shaped handset on the WE50A1 conference set does not fit into the acoustical coupler in the Xerox telecopiers! Thus, we have separate phones that also plug into the circuit. A resolve to this Rube Goldberg set-up is desirable, and we have been working with our Division of Communications on designing a small power device that will supply the power boost that is needed.

There have also been inquiries regarding simultaneous teleconferencing, that is provision for two or three teleconferences to be conducted from Juneau to various sites--all on the same day, same time. This came to light particularly during scheduling of evening constituent meetings; it required some juggling and cooperation by a number of people. There just didn't seem to be enough week nights to facilitate the majority of the 60-person state legislature!

Primarily due to these three concerns, we have investigated the new SS-4 bridging system developed by Bell Labs/AT&T, plus the Darome Meet-Me Conference bridge. We anticipate adding this or similar equipment to the existing network configuration by year end 1980. Alascom is strongly recommending we re-configure in some manner to alleviate what they call an over-load problem. They contend that the existing circuit has so many drops on it (approximately 50) that we are degrading its entire integrity plus making it more susceptible to various noise problems. We are hoping our present investigations will confirm and/or resolve that problem.

Future plans also include expansion of the network into more communities, probably also by year end. Funding is being looked into now for the addition of Seward and Homer, located along the Gulf of Alaska, and Sand Point, which is on the Aleutian chain.

User Reaction

What do our users say? Evaluation forms have been provided at most teleconferences, giving opportunity for good and bad comments. Those forms that come to Juneau from the field sites almost unanimously mention that the participant would not have given testimony had there not been access to the LTN. Many comments refer to time away from jobs, not to mention money saved by not having to go to Juneau. Legislators and staff remind us now and again of how glad they are that committees are traveling less, spending less, and plus how helpful it is to have instant communication with the information offices in their districts. A recent comment made by a state representative who is a frequent LTN-user, "It sure beats the mail!" Another legislator, who well typifies the frequent and happy LTN user, said, "The system works better than was ever expected; it really has become a tool for the legislature. The best feeling of all is to talk to a constituent about a matter only amended the same day--that is real efficiency."

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DIFFUSION OF AN ORGANIZATIONAL COMMUNICATION SYSTEM: A STATUS REPORT

Michael G. Ryan, Ph. D
and
Susan L. Baldwin, M.A.
Department of Communications
Government of Canada
Ottawa, Ontario

Abstract

This study reviews the current diffusion level of teleconferencing as an organizational communications alternative in the Canadian federal public service. This paper provides information and describes the current status of teleconferencing in the federal government, including information on the types of teleconferencing services utilized by the government and who is using them, and assesses the economies achieved. Future trends and the factors influencing those trends are discussed.

Introduction

Increasing travel and energy costs are making telecommunications alternatives much more attractive. Teleconferencing systems provide a viable and economic means of gathering remotely located individuals and groups in a common audio space for the conduct of business and government affairs.

Background

The Organization

Canada has enjoyed a leadership role in telecommunications for the past half century. A country over 3,000 miles wide with 23 million inhabitants in widely scattered locals naturally and necessarily emphasized the development and implementation of telecommunications. The Canadian federal government serves this widely dispersed population and is a major Canadian user of telecommunications.

The federal public service employs some 279,000 individuals. Three quarters of these are located in areas distant from the National Capital Region. The federal governmenet spends approximately $300,000,000 annually in providing telecommunications support for these public servants and the programs they provide.

More than 600 teleconferences per year are conducted by Canadian civil servants over leased teleconference bridges located on departmental premises. Five of these bridges are dedicated, leased and operated for and by department personnel, and some five hundred teleconferences per annum take place over these systems. The government shared service offering carries another one hundred and fifty conferences per year. These calculations do not include teleconferences arranged via commercial bridges and lines (Ryan and Baldwin, 1979).

Teleconferencing

Teleconferencing provides for several types of organizational communication behavior, including:

- multi-person communication by means of telephone hand sets;
- multi-person communication by means of telephone hand-sets combined with multi-group communication by means of group teleconferencing terminals such as the Companion Set or the NT 2000;
- multi-group communication by means of teleconferencing terminals such as the Companion Set or the NT 2000.

The technology associated with teleconferencing includes terminal equipment, transmission lines, and switching facilities. Terminal equipment ranges from telephone hand sets to speaker microphone sets. Transmission lines range from two wire telephone quality lines to full duplex broadband. Switching facilities range from add-ons located at telephone switchboards to ten-port bridges located on customer premises.

The Organization and Teleconferencing

The Canadian Government's involvement in teleconferencing dates back nearly a decade. Initial proposals for laboratory and field research were formulated as early as 1971 and 1972. User needs surveys and technical/behavioral research followed during the 1972-1975 period. This active research and development culminated with the 1976 Jull et al report which concluded that:

- existing systems had technical limitations;
- conference bridges required improvement;
- speaker identification was required; and
- the basic audio configuration required a graphics back-up.

Moreover, the report concluded that a re-allocation of 3.2% of the total federal domestic travel budget to teleconferencing would yield a return of 36% over an eight year period. The difference between the rates of return for the Department of Communications and the federal government (20% versus 36%) reflects economies of scale. By way of comparison, video teleconferencing was not deemed to be cost-beneficial as terminal and transmission costs for video systems were approximately ten to twenty times higher than the costs for audio facilities.

Such projections notwithstanding, a subsequent proposal for a half million dollar pre-operational field trial was turned down for reasons of economic restraint in 1977. In the interim a small interdepartmental shared service, coupled with a series of dedicated departmental services, evolved to fill administrative and tactical requirements. This paper focuses on both the shared and dedicated teleconferencing systems.

Shared Government Teleconference Service

Background

The Government Telecommunications Agency has offered a series of three shared teleconference bridging services since 1971. Unfortunately, each of these had technical problems which limited the growth of a shared service.

The first offering was provided to users of the Government Intercity Voice Network by means of the conferencing feature on the Bell Canada switching center. The second offering was a custom-designed bridging facility offered and managed by the Government Telecommunications Agency during the period 1975-1978. In 1978 this was replaced by the Bell Canada Pylon teleconferencing bridge on a trial basis. After modification, this bridge was introduced on a fully operational basis in 1979.

Use

Graph I demonstrates the increasing number of teleconferencing calls from 1976 to 1979. The graph demonstrates a substantial augmentation in shared teleconferencing usage. Related analysis revealed that the average teleconference during that period linked five locations and lasted some 54 minutes.

Some nineteen departments and agencies utilized the Government Telecommunications Agency shared service from February to July 1979 (Graph II). The host department, the Department of Communications, has, by far, proven to be the largest user, followed by the Solicitor General.

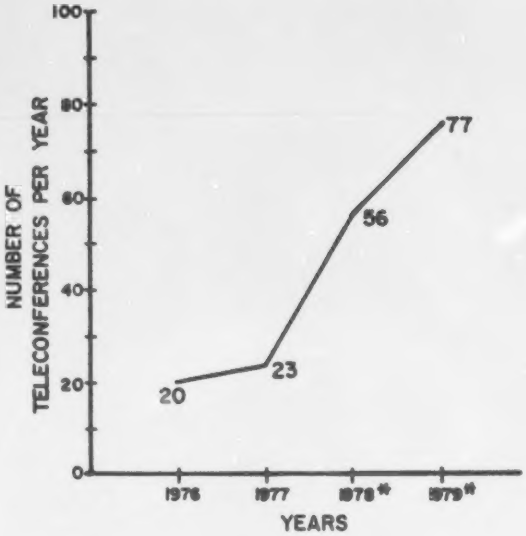
Other heavy users include Energy, Mines and Resources and Industry, Trade and Commerce. Each of these organizations is characterized by major regional activities. Users also included organizations which have dedicated systems such as the Solicitor General, Transport Canada, and the Canadian Employment and Immigration Commission.

Economies

The Government Telecommunications Agency's shared teleconference system is recovering its costs and earning a slight "profit". During the month of July 1977 the system generated $242.29 after costs based on 18 teleconferences. The costs included $675.00 rental charges for the Pylon bridge and associated locals. Charges for intercity telephone lines and teleconferencing set-up totaled $2,331.75. These costs were approximately $3,790 lower than comparable commercial services.

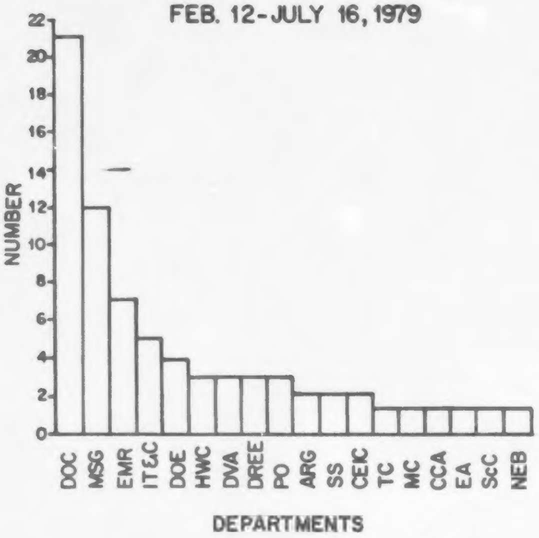
Eighteen teleconferences during the month of July assuredly resulted in cost avoidance but whether cost saving ensued is questionable. Included in these statistics is the weekly Government Telecommunications Agency senior management teleconference. These meetings involve the managers from each of the GTA regions (Vancouver, Winnipeg, Toronto,

GRAPH 1
SHARED TELECONFERENCE USAGE
1976-1979



* DENOTES 6 MONTHS OF OPERATION IN 1978 AND 1979

GRAPH II
SHARED TELECONFERENCE SERVICE
USER AND FREQUENCY OF USE
FEB. 12-JULY 16, 1979



Montreal and Moncton) as well as headquarters senior management personnel. The costs associated with a face-to-face meeting held in Ottawa would have been:

Ottawa-Vancouver..........	$444.00
Ottawa-Winnipeg...........	$244.00
Ottawa-Toronto............	$ 98.00
Ottawa-Montreal...........	$ 64.00
Ottawa-Moncton............	$154.00
	$1004.00

In addition to travel costs one would have to calculate additional costs related to: accommodation and meals, lost time, lost decision making, and personnel costs (fatique) among others.

The total cost of travel for that meeting would have been $1,004.00 as compared to a teleconference cost of $176.50. The cost avoidance provided by that teleconference would be $827.50. Should one extend that example to the 18 teleconferences held during the month of July one could argue for substantial cost avoidance.

The question of cost saving is another issue. One must ask the question: Would that meeting have been held were a teleconference service not available? Moreover, would each of the five regions have been represented at a meeting? One can only argue for cost saving if the teleconference actually replaced the meeting attended by those regional representatives.

Trend

The number of monthly teleconferences is currently increasing and will probably continue to do so until a second bridge is required to avoid blocking. A promotional program described in Ryan and Baldwin, 1979, has been developed and this should encourage further growth.

Dedicated Departmental Teleconferencing

The Public Service Commission

The Public Service Commission has had a long involvement in teleconferencing, having installed a national system in 1976. The system provides a ten port Pylon bridge with a series of 50-A conference terminals. The system links conference rooms in Vancouver, Edmonton, Winnipeg, Toronto, Ottawa, Montreal and Halifax by means of the Government Intercity Voice Network.

Use Two branches of the Public Service Commission are regular users of the system. The Regional Operations Directorate of the Staff Development Branch uses the system twice a week and the Operations Branch of the Staffing Branch uses the system every two weeks. Other branches have used the system on an occasional basis.

Economies The Public Service Commission pays $650.00 rent per month for the teleconferencing bridge and associated locals. In addition, the Commission rents seven 50-A terminals at $55.00 per month per terminal for a total of $305.00 per month. Thus, teleconference system rental totals $1,035.00 per month plus whatever intercity voice network charges are applied.

On the basis of cost avoidance the system is cost effective. The amount of cost saving, if any, has not been determined by the PSC as no systematic evaluation has taken place since the system was installed.

Trend The system does seem to be fulfilling a need and improving organizational communication within the Commission. No further promotion or publicity for the system will occur until problems associated with the system are ameliorated. Thus, in the absence of formal departmental planning of its future, the system may maintain its present respectable usage levels, levels which have remained constant for some time.

Indian Affairs and Northern Development

The Department of Indian Affairs and Northern Development has two operational teleconferencing systems, a CNCP-broadband system with Phillips terminal equipment and a Pylon bridge with Bell Canada terminal equipment.

Equipment The CNCP-Phillips system links five locations, each of which has a teleconference studio. At the Ottawa location as well as at each of the two locations in Whitehorse and Yellowknife two voice switching microphones are utilized. CNCP actually bridges locations which are linked by a dedicated four wire broadband system.

The second system utilized by Indian and Northern Affairs involves the Bell Pylon bridge which can link ten locations. A 50-A conference terminal is located in Hull and other participants on the government intercity network use their own hand sets or speakerphones. The National Capital Region has a sound-proofed teleconferencing room.

Use The CNCP-Phillips teleconferencing system is leased by the Northern Program of the Department. Senior managers use the system approximately six times a month, usually for multi-department meetings. For example, a meeting on a northern development issue might interest seven departments and the teleconference system would allow input from the Northern locations. Users perform information exchange and decision making functions on the system.

The bell Pylon system is available for use by any sector of the Department. In the first six months of the 1979-80 fiscal year the Administration and Parks sector have each used the system on four occasions, the Indian and Inuit Program used it on three occasions and the Northern Program used it on one occasion. It should be noted that usage has been quite low recently due to technical problems. It is of interest to note that, due to these difficulties, as many conferences have been held over the commercial Bell Canada Conference bridge as have been held over the departmental bridge despite the significantly higher cost associated with the commercial service.

Economies The CNCP-Phillips broadband teleconference system costs the department approximately $1,000.00 per month or $12,000.00 per annum plus toll charges related to usage. Should one assume that each of the some thirty teleconferences over the system saved one return flight between Whitehorse and Ottawa one would be able to cover the entire annual rental plus $5,820.00 of toll charges. One could, thereby, probably argue that the system provides cost saving as well as cost avoidance. The system also allows for rapid decision making during the fire season.

The Bell-Pylon system rents for $674.70 per month for a total of $8,093.40 per annum plus the rental of one 50-A terminal at $55.00 per month. No cost benefit analysis has been conducted on either system.

Trends Usage on both systems has been low during the last three months although usage patterns vary seasonally. The CNCP-Phillips system appears to be holding its own and will remain in use. The Bell Pylon usage will be slightly less than in 1978-79 if the present trend continues. The technical problems with the system have caused users to use the commercial offering as frequently as they have used the departmental system. Thus, while the absolute number of teleconferences will increase by 14% this year over last year the proportionate use of the departmental system is waning due to performance problems. Should such continue, the system lease may be terminated.

Department of Transport

The Department of Transport has utilized a teleconferencing system since 1973. The system was designed for the Air Sector's hijacking operations room and has been used to co-ordinate Canada's response to three air hijackings.

Equipment The ten port conference bridge was a Bell Canada special assembly and is surrounded by peripheral equipment added as required during the last six years. Terminal attachments include call directors, Logic 10 sets, automatic dialer, speakerphone headsets, and various handsfree speaker-listener terminals. This combination of equipment apparently meets their requirements.

Users The Air Sector is the primary user of the system with priority usage rights. Decisions related to three air-hijackings have been made over the system involving the participation of the Royal Canadian Mounted Police, the Solicitor General, External Affairs, the headquarters of the airline in question, the Federal Bureau of Investigation, and the Federal Aeronautics Administration. Air Sector administration also uses the system some thirty times per year to link the Headquarters and Regional Managers. At the time of writing the system was being used to monitor the strike of the air traffic controllers.

Trends The Department apparently intends to maintain the service as it is fulfilling a basic need related to hijackings plus related needs in respect to strike control and administration. The system technology may be reviewed in the future.

Canadian Employment and Immigration Commission

The Canadian Employment and Immigration Commission (CEIC) has been involved in teleconferencing for approximately five years. Initially, a 10 port bridge was installed; in October 1976 a 13 port bridge with an 18 port conference feature replaced the earlier system. The system includes a 50-A conference set and links Headquarters with the 11 regional offices. The Commission utilizes the Government Intercity Network.

Users The Employment Development Group of the Commission is the primary user of the system although it is offered throughout the Department for use as required. This group conducts a regular weekly teleconference involving headquarters and the regions for the purpose of information exchange.

Economies CEIC pays $600 per month for the rental of the bridge. Prior to the installation of the system it was determined that a dedicated system was more economical than using either the Government Telecommunications Agency's shared service or the Bell system. When a teleconference is required the order of priority is 1) CEIC dedicated system 2) GTA shared teleconferencing 3) Bell Canada.

Teleconferencing is used to replace travel for regularly scheduled meetings. However, its primary advantage is not the reduction of travel costs but rather the accomplishment, in a more time efficient manner, of that which would have been done over the phone on a point-to-point basis. Teleconferencing is seen as an operational requirement, facilitating management decisions and program initiation, especially in a decentralized organization. No specific economic analysis of the benefits of teleconferencing has been done. Usage has determined that the dedicated system is the most economical; however, many of the benefits are organizational rather than economic.

Trend CEIC is prepared for the growing use of teleconferencing. The current system has capacity for expansion and that will occur when usage determines it is economical to do so. Although problems exist with drop-off and poor voice quality teleconferencing remains advantageous to this organization.

Department of National Defence: Emergency Planning Canada

Emergency Planning Canada rents a ten port Pylon Bridge from Bell Canada and the system has been in operation for 18 months. Remote locations are linked by the government Intercity Voice Network.

Use The system is primarily used to respond to crises and emergencies. Two recent examples were the Manitoba floods and the Skylab return to earth. This service is available on a 24 hour basis and the usage pattern is irregular. The system has been used by other departments on a non-priority basis.

Economies System managers claim that the system saves some $5,000 in travel expenditures on each occasion it is used for an emergency. Further analysis of cost benefit trade offs has not been conducted.

Trend The teleconferencing service appears to be meeting a strategic and tactical need and will probably continue to do so. System managers propose to continue offering the service to other departments as requested.

Others The Department of National Defence also has a dedicated military switching network - the Canadian Forces Secure Conference Network. This includes a 10 port bridge; in addition, 25 "meet-me" bridges are dedicated to Air Command.

All present teleconferencing facilities are used for tactical conferences and teleconferences are arranged on an as-required basis. The people using the CSN have no access to Bell or GTA networks with respect to teleconferencing.

DND is currently investigating the requirements for non-tactical management and administrative teleconferencing and wider teleconferencing which would reduce expenditures for meetings.

Conclusion

The potential for further expansion of dedicated and shared teleconferencing services in the Canadian federal government is substantial. This wider diffusion will take place subsequent to improvements in terminal and switching equipment as well as the adoption of more aggresive promotional activities within the government. When such wider diffusion takes place the Canadian government will probably reap the benefits of improved organizational communication, rapid decision-making and lower travel expenditures.

1. Jull, G.W. et al. *Research report on teleconferencing*. Ottawa: Communications Research Center Report 1281-1,2

2. Ryan M.G. and Baldwin S. Organizational communication success: A product of promotion. Manuscript submitted to the XXX annual convention of The International Communication Association, Acapulco, Mexico, May, 1980.

MRC-TV - A LARGE SCALE VIDEO TELECONFERENCING SYSTEM
"ANATOMY OF FAILURE"

Albert J. Morris, President
&
Charles Martin-Vegue, Vice-President

Genesys Systems, Inc.
Palo Alto, California

Introduction

The Metropolitan Regional Council (MRC) of New York, New Jersey and Connecticut is one of about 700 Councils of Government in the U.S. The region covers some 5,000 square miles and has a population of about 16 million people. It was formed to provide a forum for discussion of problems which cross State, County and City boundaries: problems such as transportation, the environment, public safety, law enforcement and drug abuse. In the late 1960's, MRC conceived of a two-way interactive video teleconferencing system which would enable members of the participating governments to meet without having to face the time, frustration and even danger of traveling to and from meetings in this most densely populated area of the U.S. This concept led to MRC-TV, which was made operational in June, 1973 and ceased operations at the end of June, 1979. Technically, the television system performed as expected. Failure of MRC-TV was due to lack of a clear understanding of how such a system needed to be used, lack of a plan for full utilization and commitment, lack of expertise and imagination by the system managers, and weak management.

MRC-TV was a technically unique system. The system was even financed in a very unique way. This paper treats what and how things were actually done, along with suggestions of what and how things probably should have been done based on experience elsewhere. The reasons for failure, along with possible cures for this, are pinpointed. Video teleconferencing is in its infancy. Failure of a major system can severely inhibit future progress unless the reasons for this failure are understood and unless possible paths leading to success are clearly delineated.

Background

Teleconferencing is a relatively old concept. Its potential to overcome the inhibiting effect of geographic barriers has been recognized for a long time. And, a number of private teleconferencing systems have been in successful use for years. The application of teleconferencing in general to alleviate urban communications problems and to provide training for government employees has been treated extensively[1,2,3,4]. The metropolitan region surrounding New York City is the most heavily populated in the U.S.; it includes some 550 municipalities in the Tri-State area within a 40-mile radius from the tip of Manhattan. It should have been a perfect test vehicle for a teleconferencing system. This highly congested area formed a Regional Council in 1956. Early efforts to use telephone teleconferencing were considered unsatisfactory. The number of participants in different locations was large and much time was wasted in the speakers constantly having to identify themselves.

The two-way TV network was the brainchild of the first MRC President, Robert P. Slocum[11], who developed the idea several years ago while driving back from a meeting with government officials in Linden, New Jersey. Recalls Slocum: "I got caught in one of those tremendous traffic jams and I thought that there's got to be a better way for us to communicate without leaving our offices or using the telephone. The idea for the Tri-State TV network was born at that instant." Armed with a $60,000 grant from the Department of Housing and Urban Development, MRC was able to conduct site surveys, hire a consulting engineer, and conduct financial and technical feasibility studies.

In those early days (about ten years ago), it was contemplated that TV links would be established with the State capitals in Albany, N.Y., Trenton, N.J. and Hartford, CT as well as Washington, D.C. This was to enable local government officials to have face-to-face meetings with state and federal representatives and receive assistance in obtaining grants. Also, when the TV system was planned, a typical week's program schedule was to look like Figure 1. Note that programming was contemplated from 10:00 a.m. to past 8:00 p.m. all during the week and that the programming was to involve interaction between officials in many different areas of

	Monday	Tuesday	Wednesday	Thursday	Friday
10 AM - 12 NOON	Chief Elected Officials	Social Service Commissioners	Health Commissioners	Narcotics Prevention Programs	Planning Directors
12:30 - 2:30 PM	Sub-Regional Meetings	Sub-Regional Meetings	Sub-Regional Meetings	Sub-Regional Meetings	Sub-Regional Meetings
2:45 - 4:45 PM	District Attys. and County Prosecutors	Federal Aid Programs HEW	Data Processing	State Aid Programs	Federal Aid Programs HUD
5-6 PM	Law Enforcement	Law Enforcement	Law Enforcement	Law Enforcement	Law Enforcement
6-8 PM	Education	Education	Education	Education	Education
8 PM	Emergency Planning and Police	Emergency Planning and Police	Emergency Planning and Police	Emergency Planning and Police	Emergency Planning and Police

FIGURE 1 - TYPICAL PROPOSED PROGRAM SCHEDULE - MRC-TV

government. Education was planned to be less than 20% of the total effort.

MRC-TV System Description

As conceived, MRC-TV was to provide for two-way interactive video teleconferencing. Programs could originate at any remote two-way site or at the Central (command and control) site at the World Trade Center Building in New York City. TV programs originating at any two two-way sites could be seen by all sites at one time by means of split-screen television. A remote two-way site could repeat programs received from the Central site transmitter to enable sharing the programs with one-way receive-only sites in the local areas surrounding each remote site. Alternatively, each remote two-way site could originate its own program which could be shared only with its local community, or shared as well with the Region through MRC-TV or transmitted only to the Region and not locally. The Central site could act as a passive repeater of remote two-way site signals, or it could originate a program and become a primary transmission site, or it could, by split-screening, transmit its own program along with that of any one remote two-way site. The Central site controlled which of the programs were to be shared by all system participants.

Figure 2 shows the geographic distribution of all sites. Figure 3 shows the Central site command and control console. Figure 4 shows the Central site studio. Figure 5 shows a typical remote site studio, and Figure 6 shows a typical operational remote site meeting. A detailed technical description of MRC-TV and its design is given in Microwave System News[5].

MRC-TV Financing

MRC was not a government agency, it was a consortium of governments. As such, it had no tax base and relied on dues paid by the participating municipalities plus income from government grants and contracts to conduct its operations. It had no capital funds with which to buy the TV system ($750,000), but it received commitments initially from eleven governmental units to install two-way interactive sites and pay MRC $14,000 per year per site. These commitments were sufficient to enable MRC to enter into a ten-year lease agreement with Genesys Systems, Inc. of Palo Alto, California to provide and install the equipment.

Due to municipal law, no governmental agency may sign a contract for services for a period of longer than one year. Therefore, all of the contracts between MRC and the local municipalities were for the period of one year. However, based on the enthusiasm with which local government officials had responded to the new communications system, it appeared highly doubtful that a community would agree to have antennas and towers installed at their building and an entire studio installed within their building and cancel their agreement with the Council after only one year. Genesys was willing to take this risk on the basis that payments received by MRC for use of the TV system would be used to make the lease payments. In practice, none of the municipalities dropped out during the first five-year period of MRC-TV operations.

In addition to the original eleven participants, at least seven more two-way site participants were projected along with at least fifty one-way (receive-only) sites, each of which was expected to pay $2,000/year. Also, MRC committed to use funds from numerous other sources of income to make its lease payments if necessary. In essence then, in Genesys, MRC found an organization willing to provide the front-end financing and capable of designing and installing a sophisticated communication system.

MRC-TV Studies

The MRC-TV concept was studied almost entirely with funds provided by NSF[6,7,8,9,10]. If the several hundred thousand dollars probably expended in "studying" MRC-TV had been instead devoted to making MRC-TV work, the situation might now be different. It is worth reviewing these studies in the context of what actually happened.

The first Study[6] describes a method and plan for evaluating MRC-TV's impact on intergovernmental communication behavior of top public officials and to identify the factors contributing to MRC-TV's performance as an intergovernmental communications mechanism. The intent was to provide a guide for comparable systems in other locales. The basic approach was to compare behavior before and after MRC-TV for both users and non-users. Information was to be derived from questionnaires and interviews. The evaluation objectives were to look at:

Assessing the Impact on Intergovernmental Communication Behavior
- Communication Mechanisms
- Communication Content
- Communication Frequency
- Communication Mode
- Communication Patterns

Impact on Participants' Attitudes and Perceptions
- Communication Incentives
- Communication Obstacles

- Feelings about Intergovernmental Contact and and Action

Impact on Actions

Unanticipated By-Products

Identifying and Assessing Behavioral and Technological Aspects of System Operation and Effectiveness

The MRC-TV effort from June,1971 - March, 1972 was reported by Rand[7]. It was summarized in the form of an MRC report[8] for MRC officials and others. Responses were received from 648 officials, including: elected executives; legislators; clerks and professional administrators in education, finance, personnel, public safety, health, welfare, community relations, housing, planning, public works, transportation, environmental protection, and general management; officials in federal, state, county and municipal governments, as well as officials from school districts, special districts, and regional agencies and authorities. Key results were:

- The most important (existing) communication methods in the region for public officials are meetings of informal peer groups, professional organizations, and government associations. These informal meetings apparently seldom cross State or County lines. There is a demonstrated need for tying together and improving the effectiveness of these communications.

- How government officials contacted each other was of significant importance. It was found that impersonal modes of communications were generally in the form of telephone calls and some face-to-face contact, although not as much of the latter as officials desired. There are no systematic means for data transmission and communications on a region-wide basis. Conference calls are not used extensively. Officials rely on correspondence, one-to-one telephone calls and such impersonal media as newsletters. Newsletters and journals were widely read by officials. Respondents listed membership in 552 professional and governmental organizations, each with its own publications.

- It was found that there was a significant difference between the type of communications taking place within a government, e.g. interdepartmental, with that taking place among different governments. There was a further differentiation in communication among different governments based on the level of the governments communicating. It was found that 70% of the respondents communicated with other departments or agencies in their own government at least weekly. This type of communications dealt primarily with administrative, personnel or financial matters. Most respondents felt that such intra-governmental communications were necessary to improve coordination.

- The substance and reasons for inter-governmental communications are more complex. Contacts among governments at different levels (e.g. Municipality-County or State-Federal) deal almost exclusively in some form or other with financial aid. Contacts among different governments at the same level (e.g. Municipality-Municipality or County-County) deal with problems held in common as opposed to problems of regional concern. When asked which of seven possible statements best typified the respondents own experience in inter-governmental communications, 58% listed "It usually results in cooperation and/or resolution of differences".

- When asked about training opportunities,most respondents felt that the training effort of their government was inadequate. When asked what they would do with 45 minutes a day for job related training or education: 48% said they would prefer talking with knowledgeable persons in their respective fields; thirty-four percent would rather read books or articles on their own and 14% would attend college classes. Most of the respondents had little or no contact with college or research staff in terms of discussing community or administrative problems. The implication here for MRC-TV is apparent. Quality programming aimed at the need for training curriculum would be well received. The ability to bring the very best resource persons via television to the many counties and major cities on a regular basis would be a major contribution to upgrading skills and understanding among public officials. Would government officials at all levels be resistant to this type of electronic communication with its inherent multitude of practical applications? Probably not, since the majority of questionnaire respondents felt that the "climate or receptivity for change" was good in their offices or agencies.

- Obstacles to intergovernmental communications in the region included foremost, the difficulty in knowing who to contact in other governments, followed by the fact that many people in other governments are unresponsive. Ironically (for local public officials),Federal and State respondents also listed these points as being difficulties in intergovernmental communication.

- A majority of respondents conducted joint programs or operations with other governments.

- It was concluded that a real and immediate need for a regional communication system existed in the metropolitan region and that with the joint effort of governments MRC-TV could fill the communication need and offer government substantial benefits in terms of efficiency and responsiveness.

The entire period 1969 - January, 1974 is reviewed by Rand[9]. This must be read in the context of the positive conclusion previously drawn[7] about the role of MRC-TV. The Report

Summary states:

- The MRC-TV system is not the first use of television to join together two widely separated groups for a single meeting. It is the first, however, to join as many as ten together at once. It is not the first TV system to be called interactive; but it is the first to join so many locations in a two-way (symmetrical) system: audio and video to and from each site. This unique capability, allowing people to both see and hear each other in a natural conference relationship, appears particularly well suited to the communication needs of government officials. The motion video component allows for a degree of interpersonal rapport similar to face-to-face interaction. When used for instructional purposes, the two-way feature encourages an interaction between teacher and learner that is highly prized but not always achieved in face-to-face classroom teaching.

- MRC-TV consists largely of conferences, meetings, and seminars, whose planning and development are probably similar to what goes into conventional face-to-face conferences. Twenty-five meeting groups of functional counterparts, such as a group composed of personnel directors, and another composed of purchasing agents, have been organized and have used MRC-TV on a regular basis to discuss common problems. In addition, regular in-service training courses for county personnel have been instituted.

- Generally, the MRC-TV system has 20 to 30 hours a week of regular use. Its physical operation requires a basic staff of one communication director at the World Trade Center headquarters and one maintenance technician for the entire system, plus part-time county-employed operators at each outlying location. One MRC staff member is responsible for all instructional courses. The equivalent of four staff members plan meetings, each staff member preparing two to four specials or intergovernmental meetings per month.

- So far, the average number of county locations participating in the regular intergovernmental meetings has been six; the average number of participants at each location, two. Attendance at special seminars and the in-service training courses is often 10 to 20 at each site. Although a comparison with the costs of face-to-face meetings was not part of this study, a rough comparison suggests that when the value of people's time is taken into account, the MRC-TV cost per meeting, even at today's relatively low level of programming, compares closely with the travel alternative.

- Despite the fact that visual information, such as graphic materials, maps, charts, photographs and the like, has played a minor role in MRC-TV meetings, many observers felt that the use of full two-way video is justified by the added contact and increased rapport that it appears to generate between participants. These judgments are made in relation to telephone interaction on the one hand, and face-to-face meetings on the other, since these are generally the only two interactive methods with which most people have had experience.

- The system appears to be enthusiastically accepted by most of its users; it is doing what it was intended to do; it is clearly resulting in a large amount of local government interaction that was not going on before; and it is bringing interactive training in many subject areas to county and municipal employees who did not have in-service training opportunities before.

Clearly, the Rand Report[9] represents a very positive picture of what was taking place. Was this picture "real" or "illusory", or did something significant change between April, 1974 and July, 1979? It is interesting to note here that the final phase of the Rand study of MRC-TV was never carried out. It was intended to involve analysis and measurement of major changes in intergovernmental interaction brought about by the system, test hypotheses previously formulated by Rand[6] and determine cost-effectiveness of services developed by the system.

A final study of MRC-TV was made by Columbia University[10], again funded by NSF. Apparently, what they studied was what Rand expected to do as the final phase of their work. Why a change was made is not known. Unfortunately, the Final Report on the Columbia University study was never accepted by NSF--it was considered inadequate. Nevertheless, a draft of the Final Report has been reviewed. It purports to measure the relative costs and benefits of conventional versus televised conferencing in the MRC-TV region. Some of the "tentative" conclusions from this Study were:

- The relative effectiveness of conventional and TV conferences depended on specific goals. Subjective measures of participant satisfaction generally yield better ratings for TV than for conventional conferences. However, in tests of information retention, those who attended conventional conferences scored about 10% higher than those attending TV conferences. Conventional conferences were also more effective in facilitating most forms of information exchange among participants and in inducing attitude change. When participants were asked about the extent of their follow-up contacts with fellow participants and the usefulness of the conference to their subsequent problem-solving activities, those who attended the TV sessions rated the value of the conference more highly than those who attended the conventional sessions. Taken together, these findings suggest that no single statistic is appropriate as a summary indicator of the relative effectiveness of TV and conventional conferencing. Either can be superior to the other, depending on conference goals.

- The cost analysis demonstrates that the TV system can be as much as one-third lower than conventional conferencing formats in overall conference costs, per participant (including institutional overhead, operating, and facilities costs as well as travel and time costs of participants). Three factors dominate the relative cost-effectiveness of the two conferencing media: the utilization rate of the TV conferencing facilities, the extent to which a TV conference can draw more participants than a conventional conference, and the extent to which costs of individual travel and participation are lower for TV than for conventional conference participants.

- The political, administrative, and transportation characteristics of individual metropolitan areas seem likely to be the best determinants of whether a competently managed TV conferencing capability would be likely to have significant cost advantages.

- Of primary concern is the extent of region-wide governmental activity. Because the system's utilization rate is critical, it is important that there be an extensive and continuing range of regional issues that are of sufficient concern to government officials to draw them regularly to the TV sites. Where a single government with region-wide jurisdiction does not exist to define such issues, maintain agencies to manage them, and direct its employees to coordinate activities throughout the region, there is only a limited natural constituency for a TV conferencing system.

- It is possible for a council of governments to organize individual conferences--as MRC did for this Study--but to do so on a scale that makes effective use of the TV system's capacity requires a very sizable organization of conference organizers and planners, as well as a capacity to consistently draw external funding for programming support. Though such a strategy is quite plausible for major metropolitan areas, it does impose a heavy programming burden on the sponsoring organization. The task of achieving and maintaining cost-effective levels of utilization is likely to be much less demanding where operating government agencies have on-going programs that require regular communication among their personnel located in field offices throughout the region.

- A second factor of importance in determining the potential cost-effectiveness of a TV, relative to a conventional, conferencing system, is the extent of clustering of potential participants. Where administrative and/or political structures group large numbers of officials from various agencies into regional field office centers; or where Municipal, County, and State offices are clustered together in local government centers, access to satellite TV studios located in such centers is greatly facilitated. This is likely to strengthen the drawing power of a TV system relative to a single-site conventional conferencing system and to reduce costs to participants, two of the key variables in determining the cost advantage of a TV system.

- The New York City data suggest that the character and quality of public transportation are important in determining the cost saving potential of a TV system. Effective mass transit systems that facilitate fast movement into central city locations are likely to significantly reduce the travel and time cost advantages of a TV capability that show up very clearly among participants who used private automobiles.

- The closed-circuit interactive microwave technology appears to be a promising innovation for use in urban government. The characteristics of individual metropolitan regions should be a major consideration, however, in any strategy of diffusion.

MRC-TV - The Reality

MRC ceased operations on June 30, 1979. They ran out of money. For several years prior to this, MRC did not receive the level of funding from government contracts and grants that was anticipated. Regular dues from MRC members were insufficient to cover the deficit. As a result, starting in early 1976, MRC utilized income from TV system participating members to cover the financial gap. These were funds, which,by agreement, were to be used to meet MRC's financial lease obligations to Genesys. The shortfall in funding resulted in programming becoming ineffective and system maintenance becoming inadequate. This in turn led to increasing dissatisfaction on the part of TV system users and eventually to reduced participation. The inevitable downward spiral was never checked.

The MRC financial situation was known to all of its constituent municipalities. It created a very negative image for MRC within its own family, one which was not conducive to providing MRC with support. It certainly mitigated against growth of the system and the willingness of government groups to make continuing financial commitments. The situation also created a severe emotional and time drain on key people.

Also fundamental to MRC's poor financial situation was their inability to receive timely payments for TV system usage from the beginning of operations. MRC's management often relied on an indication of interest or a promise to pay at some undetermined later time from the participating municipalities. They unwisely did not insist on signed commitments from the participants before implementing the two-way facilities and providing program service. Thus, even the TV system income due MRC was often six months to a year late.

Figure 7 shows the MRC-TV program schedule for July,1978. Note that it had "degenerated" to providing training only. Gone were the "glory" days when intergovernmental teleconferencing was the "raison d'etre". MRC did not have the people to arrange for conferences and it did not have the people to do a decent job on performing on the government grants it did get. And, it didn't get paid anything reasonable for providing the educational programming that it offered over the TV network. The bubble had burst.

Also, long before the end, it was clear that the proposed extension links of MRC-TV to the State Capitols would not be implemented. This resulted in loss of a potentially powerful link between State officials and those of local governments--a link which in itself might have saved the system. As it was, a number of State and Federal officials came to New York to hold meetings over the TV network. When this happened, they were usually successful--but they never happened often enough.

MRC-TV - The Fix

In January, 1978, Genesys made a desperate attempt to help the MRC situation. It initiated a series of "Recommendations for Improving MRC-TV Operations and Improving the MRC-TV Financial Position" which were presented to the MRC Board. These recommendations were apparently never considered. The following outlines these recommendations:

"MRC-TV Operations - Situation Summary"

- Technically, the system is well designed, and when it is well maintained, it operates very satisfactorily. Unfortunately, it is not always well maintained. There is only one man, and he needs help --and more help means more money. Therefore, more money available for system maintenance is a fundamental necessity for success.

- More technical help is necessary but by no means sufficient. If the system operated perfectly all of the time, it would still be unsuccessful as it is presently being managed and used. MRC is now headed by Mary Haris. Mary is a gifted, charming and capable lady, but she has no experienced back-up support. She has some young planners working for her, but they do not have the background and experience needed to help make MRC-TV viable. As a result, everything falls on Mary's shoulders, an almost impossible situation for her and perhaps for any single person, no matter how energetic and well qualified.

- With no increase in cost, MRC-TV is capable of serving 10 - 100 times as many locations as it now does. This makes it obvious that,within the context of what MRC-TV is now doing, the first priority is to provide service to more "customers", i.e. more counties or cities. The necessity for this has been known from the beginning, but the best efforts of Bob Slocum and Mary Haris have not achieved this goal.

- For years, MRC-TV has lived a hand-to-mouth existence, kept alive by a few dedicated people. Its lack of success is not related to lack of effort by those people or lack of dedication. Nor is it related to the concept of the TV system not being viable. Frankly, the TV system has never been given a real chance. It has never received serious attention by the MRC Board--the kind and level of attention which is needed and which could make MRC-TV a success.

"MRC-TV Operations - What is Proposed"

- As indicated, improvement in technical operations will require more money. Getting more money is dependent on reaching a larger constituency. To reach a larger constituency requires more help, help of a different kind than is available now to MRC. What is proposed in the fol-

	Monday	Tuesday	Wednesday	Thursday	Friday
10 AM - 12 NOON	Speed Learning (Session 8-Live)	Solid Waste Management (Seminar III - Waste Reduction - Live)	Investigative Function (Session 5-Live)	Your Money Matters (Session 1-Live)	The Management Process (Session 1-Live)
12:15-12:45 PM	Public & Business Administration (Session 35 - Tape)	Public & Business Administration (Session 38 - Tape)	Public & Business Administration (Session 39 - Tape)		Public & Business Administration (Session 40 - Tape)
1:30-3:30 PM	Adv. Arson Investigation (Session 9-Live)	Grantsmanship Seminar (Session 6)	Shorthand II (Session 9-Live)	Bus. English & Communication (Session 4-Live)	Visual Aids - The Techn. Know-How (Session 1-Live)
3:30 - 5:00 PM					
5-6 PM					
6-8 PM					
8 PM					

FIGURE 7 - MRC-TV ACTUAL PROGRAM SCHEDULE - JULY, 1978 (1 WEEK)

lowing paragraphs is based on precedent. Whether it is viable depends on the willingness of the MRC Board to implement the plan and put in the effort to make it work.

- Specifically, it is proposed that two full-time senior people be "loaned" to MRC-TV on an annual basis as a public service. These people could be made available either by one or more MRC members or from local business or industry. The precedent (at least in the San Francisco Bay Area) is business and industry doing exactly this in connection with Annual United Fund drives. During the year, new people would be lined up for the following year and brought in early (part time) for full indoctrination. One of these two people would be responsible for maximizing utilization of MRC-TV by existing members and for bringing in more participating government groups. The other person would be responsible for maximizing utilization of MRC-TV by other users, such as H.U.D., Commerce, Business, Industry, Education, etc.

- Key to expanded utilization of MRC-TV by existing members and expanding its utilization of MRC-TV by others are volunteers who would serve on program committees to arrange for and schedule programs of interest to their special interest groups and who would also help solicit new participants. Each participating county (or city) could assign volunteer committeemen to serve in different areas, i.e. finance, planning, public works, administration, etc. Each would serve a three-year term (staggered) and each committee would be made responsible for the success of the system by programming serving their special interests and needs. This would bring in many more people, all senior and well qualified,and all identifying with the common goal of making MRC-TV successful. There is much precedence for this approach. Many Professional Societies have moved in this direction in order to be successful. For example, again in the S.F. Bay Area, about twenty years ago, the Institute of Radio Engineers had one organization, the San Francisco Section, which held monthly meetings. The attendance was often marginal. Then the "Professional Group" system was inaugurated. Now there are twenty-five groups involved, scheduling 25 monthly meetings, and instead of five volunteer people doing the work, there are more like 125 volunteers. It is not necessary or even desirable to use full-time staff to do the planning or arranging of professional meetings. The staff should provide support and service so that the professionals can accomplish their objectives.

"MRC-TV Financing - Sources of Funds"

- This is an area where action by MRC Board members (at their level) is essential. What is needed now is an "angel" or "angels" to provide transition funds so that the actions recommended above can be given time to succeed and MRC-TV can then become self-supporting. MRC-TV is a system unique in the world. It is located in the heart of the most densely populated part of the country. Its potential to benefit the community--in many different ways--is very large. Surely, in the area in which MRC-TV operates there are Foundations, Corporations and individuals that might be made to see the benefit of "bridge" financing for this great resource. None of the MRC-TV staff know these sources or people or know how to approach them. But, the MRC Board surely does. The amount of money "given" by organizations and people in the MRC-TV area as gifts or grants every year is in the tens of millions--and it is given for every imaginable kind of thing. Why not MRC-TV?

There is another major way that MRC could have been saved,which again was ignored by the MRC Board. It relates to "commitment". As an example, when the Stanford ITV Network was being planned, part of the plan evolved a concept of forming an "Association for Continuing Education" (ACE). ACE was to be a non-profit educational consortium of all Stanford Network participating organizations which would program the Stanford ITV Network with programs of interest to a broad spectrum of employees (not just engineers and scientists) during the hours that Stanford University did not offer graduate engineering courses. ACE was formed with enthusiasm but went bankrupt 2 - 3 years later,another apparently good idea which didn't work out in practice. But, the reasons for ACE's initial failure were analyzed and attributed to the policy of ACE charging a fee for each student participating in an ACE course, along with lack of identification with and support for the ACE concept within each participating organization. The "fix" was to get the participating organizations to make annual financial commitments, scaled to organization size, which in total were sufficient to insure ACE's operational viability. The quid pro quo for such commitments was to allow unlimited student participation in each course without additional fees. In addition, each organization appointed an ACE coordinator who was responsible for promoting ACE within the organization so that the organization would derive maximum benefit from its commitment. ACE turned around immediately and has been growing and operating with a surplus for years.

There are a number of essential truisms which can be learned (again) from the MRC experience. First and foremost, having a good concept is necessary for success, but it alone is not sufficient. How the concept is implemented is critical. If success is not achieved the first time around, the concept must be reevaluated. Positive results from re-evaluation must lead to analysis of causes for failure by competent people who are experienced but who also care. And, this analysis must be conducted in the context of experiences elsewhere--both positive and negative. Even if the concept is perfect and the implementation plan is well conceived, good management and good leadership are essential as is sound financial planning. Finally, a policy setting group (Board) must be established which is composed of people with both competence and dedication. In the case of MRC-TV, the concept was excellent. But, in every other respect, the points outlined above were either ignored or violated--and failure was inevitable.

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TELECOMMUNICATIONS FOR CONCERNED CITIZEN INVOLVEMENT

Carroll Hostetter, Paul Bowerman, O. J. Collins and Joe Westerheide
Consumer Involvement Project
Rehabilitative and Visual Services
Oklahoma City, Oklahoma

Introduction

The Consumer Involvement Project has never remained stagnant but has continued to change and evolve. The Project Staff, Administration, Advisory Board and all others concerned have always demonstrated flexibility and a willingness to try new approaches and encounter new experiences. Although consumer participation has been with us for several years, everyone has been used to face-to-face meetings. The use of telecommunications equipment has proved to be quite a change from tradition and therefore has boggled our minds in many respects. There is a lot that we have learned and much still to be learned in effective utilization of the systems.

Consumer involvement has become a critical aspect for the effective administration of almost every public service program. Consumers have had a tremendous effect upon the State Federal Vocational Rehabilitation Program with respect to establishing new trends, goals, objectives and directions. We find new examples everywhere that indicate improved services when the provider and the recipient communicate their needs and ideas cooperatively. We have completed two and one-half years of consumer involvement through the use of telecommunications. None of us feel satisfied with the speed at which we have moved. At times it seems as though we have progressed only at a snail's pace. But this is frequently the case when so many people from such variant orientations are brought together to work on problems of mutual concern. Although our progress has been slow, our efforts, time and energy certainly have not been wasted.

Various agencies are attempting to gain consumer input in a variety of ways. Some agencies have statewide meetings once or twice a year. Other agencies have inward WATS telephone lines which allow people to call in their views or complaints. A fairly popular approach has been to conduct regional meetings and then a statewide meeting of representatives of each region.

In Oklahoma, the Rehabilitative and Visual Services agencies devised the plan of using the "talkback" television system operated by the Oklahoma Regents for Higher Education. The system is called the "Televised Instruction System" and is operational in sixty-two sites throughout the state. Ten of these sites have the capability of originating video into the system, and all have audio or "talkback" capability. These sites are located, for the most part, in educational facilities throughout the state. Some are located in industry where a number of employees take part in the televised courses.

There are sixty-two stations hooked up on the network. They are housed, for the most part, in institutions of higher education, but there are also some sites located in industrial and other facilities where there are sizable numbers of employees taking part in "talkback" courses. Their system is best represented in areas of the state where the population is greatest. With respect to the location of talkback sites, twenty are in colleges or universities; eleven are in junior colleges; ten are in hospitals; seven are located in prisons or correctional institutions; five in industrial facilities, four in vocational/technical schools, two in higher education centers, two at military bases, and one is in a library in Oklahoma City. Every site which is patched into the system (this is done at the transmitter site in Oklahoma City) is capable of one-way video and two-way audio. That is, each receiving site can receive both picture and sound and can transmit sound. The "talkback" audio section is done over telephone lines while the audio portion of the teacher is carried with the video on microwave relay.

In addition to the talkback television network, there is a teleconference system in operation in hospitals throughout the state. Approximately ninety percent of the hospitals are connected to the network, so most of the state is covered.

Funding

The project is funded by a three-year grant to the Oklahoma Department of Human Services, Rehabilitative and Visual Services Unit, from the federal office of Rehabilitative Services Administration. The grant began in October, 1977, and will end September 30, 1980. The amount of funding has varied from year to year but the average has been approximately $80,000.00. This covers salaries of people assigned to the project as well as usage time on the statewide systems of televised instruction and teleconferencing. Travel has been provided for all participants as well as reader services, interpreters and attendant care for consumers with severe disabling conditions.

Activities and Goals of the Project

The ultimate goal is to improve services to the handicapped people of Oklahoma. In order to understand better what those needs are, the Rehabilitative and Visual Services agencies in Oklahoma continue to request input from consumers, their families, friends, as well as the people who are involved in the delivery of services, such as doctors, nurses, counselors and those who provide personal and attendant services.

During each of the teleconferences, whether it be through talkback television or the hospital hook-up, the participants are afforded the opportunity to speak their minds on issues which they consider important. A group of people will then look at the problem in their own communities and get together with other folks who are examining the same problem in different communities. Suggestions for change or improvement are then formulated and are given to the administrators of the Rehabilitative and Visual Services (RVS) agencies. The RVS Administration will then examine each of the suggestions and see if it is something that can be done and still remain in the province of federal and state law. A report is subsequently made to the consumer group via teleconference and by written notice so that people will know the disposition of their suggestions. It is through these two teleconference systems that the Consumer Involvement Project has been working. The benefits are fairly evident. Since most people do not live far from an institution of post-secondary education, a participant does not have to travel far from home to take part in the meetings.

Unique Features of the Project

Oklahoma is the only state in the nation which is using telecommunications as a technique of obtaining consumer involvement in policy development. Consequently, we are developing a model which may be implemented in other states which have the capability for teleconferencing.

There have been some two hundred participants involved in the project so far. Some attended just one of the meetings and others have attended all of them. So far there have been seven meetings open to the general public. There have also been meetings over the teleconference system of the Advisory Board, as well as staff meetings. At the beginning of the project, participants were selected on the recommendation of Vocational Rehabilitation and Visual Services counselors, state agencies serving the disabled and handicapped organizations. On October 11, 1979, the Rehabilitative and Visual Services agency and the project changed their procedures so that anyone who was interested in the policies and procedures of the agency could participate. Public notices, press releases and bulletins went out over the state to spread the word about the open meetings.

"Talkback" Television

"Talkback" television is the popular name for the Televised Instruction System operated by the Oklahoma Regents for Higher Education. The system operates through a series of microwave relay transmitters which are set up in legs or bridges across the state. Each "leg" will cover a certain geographic area, and the next farthest leg will connect to it to get the signal.

Hospital Teleconferencing

The Oklahoma Area Medical Continuing Education Teleconference Network links one hundred ten hospitals in Oklahoma, Eastern Kansas, and Northern Texas. The Hospital Teleconferencing Network is a four-wire, dedicated, audio communication system which is two-way, allowing any participant to be speaker or listener as easily as one talks on the home or office telephone.

Each participating hospital has on staff a person who serves as coordinator for continuing education at that facility. Lectures can originate at any point on the network or at any place in the country where there is a telephone. Frequently, out-of-state, guest lecturers deliver talks from their offices over the system. The savings in travel time and expense are obvious.

The hospital teleconference system allows long distance callers to be a part of the conference. For instance, it may be desired to have someone in Washington, Atlanta, or Dallas take part in the conference. It is accomplished just by dialing the person on the phone and he or she is immediately a part of the conference without further switching or patching of lines. This feature was utilized once when we had Mr. Philip Chase of Georgia, and Mr. Glen Ford of Texas, share information with the Consumer Advisory Board through the hospital teleconferencing system.

Each hospital on the network shares in the cost of the system which is prorated on the basis of beds or number of patients. This allows even the smallest hospital to be a full participant.

Hospital education coordinators have worked closely with Southwestern Bell representatives to design and put into operation this statewide system. The hospitals recognize the potential teleconferencing has for their own communities, so they have been generous in sharing their facilities with health-related endeavors when no conflict exists with scheduled programming. During the course of the consumer project, we have conducted a total of fourteen Advisory Board meetings of which eight have been over the hospital teleconferencing system.

Operation and Outcome of Plan I

Plan I represents the initial organization and operation of the project and guided the project's operation from about January 1, 1979, to April 7, 1979. During this period, the project operated in a manner that was aimed at forming and operating local study groups chaired by Advisory Board members. Our Advisory Board consists of fifteen individuals who were nominated by the handicapped community to represent them at the 1977 President's White House Conference. From issues proposed by consumers, the Advisory Board selected five issues to be studied during the "Policy Study and Consultation Cycle".

Plan I and the selection of Advisory Board and Task Force members are described in Telecommunications for Concerned Citizen Involvement: A Plan (Westerheide, Bowerman, Collins and Hostetter, 1978).

Plan I represented an ambitious undertaking both in telecommunications and consumer involvement. It sought to organize the Higher Education Televised Instruction System (Talkback TV), the Hospital Teleconference Network (two-way audio), the State Library Inter-Library Loan System and the RVS Agency into a coordinated system for consumer study and input into RVS Agency policy decisions. This plan put considerable faith in the possibilities for interagency cooperation and the ability of the organizations operating the telecommunications systems to expand their usual operations to encompass these additional activities. The plan also assumed that both Agency personnel and consumers were willing to put forth a major amount of effort in understanding and utilizing a fairly complex procedure for obtaining consumer input into policy decision making. This procedure was called the Policy Study and Consultation Cycle.

The Policy Study and Consultation Cycle described a method for both the RVS Administration and the consumer to study specific issues, communicate and receive feedback from each other and for consumers to make positive and concrete recommendations on policy issues. The Policy Consultation Cycle included five distinct phases: 1) Issue Identification and Selection; 2) Issue Study and Initial Report; 3) RVS Review and Discussion of Initial Report; 4) Finalization of Study Recommendations; and 5) RVS Status Reports. The five phases of the Policy Consultation Cycle were to be completed in a year. In situations where there was not sufficient time to complete the study of a policy issue, the Advisory Board was to act as the consumer consultation group.

Four issues were selected by the Advisory Board for study and a standing study group was maintained to identify and study uniquely local issues. Each study group was coordinated by three or more Advisory Board members with the remainder of the study group composed of local Consumer Task Force members. The Task Force members were located at fifteen different talkback television sites around the state. Participants at each local site selected the study group on which he or she wanted to participate.

The five phases of the Policy Study and Consultation Cycle are outlined in Figure 1. Each phase is built upon the successful completion of the preceding phase and has its own unique purpose. The telecommunications component of each state enabled a greater breadth and depth of study and participation than would otherwise be possible.

The implementation of Plan I met with considerable difficulty and the cycle was not completed. At the time Plan I was abandoned, three talkback television conferences and one hospital teleconference had been held and the plan was in Phase III (see Figure 1.).

Figure 1

Policy Study and Consultation Cycle

Phase I: Issue Identification and Selection

- Step 1: Collect issues and concerns for possible study.
- Step 2: Select issues for study during cycle.
- Step 3: Develop and circulate initial description of issues.
- Step 4: Talkback TV Conference for presenting issues to Task Force.
- Step 5: Task Force members select the study group that they will work on.

Phase II: Issue Study and Initial Report

- Step 1: Study group members study the issue selected.
- Step 2: Hospital Teleconference to combine findings into Initial Report.
- Step 3: Initial Report is circulated to study group.
- Step 4: Study Group Coordinator presents Initial Reports to Advisory Board for review and comments.
- Step 5: Initial Report and comments forwarded to RVS Administration.

Phase III: RVS Review and Discussion of Initial Report

- Step 1: RVS personnel review Initial Report.
- Step 2: Hold Talkback TV Conference to discuss Initial Report and policy alternatives.

Phase IV: Finalization of Study and Recommendations

- Step 1: Study Group review RVS comments individually.
- Step 2: Hospital Teleconference to develop Final Report and specific recommendations.
- Step 3: Final Report is circulated to study group, any minority views accepted for inclusion.
- Step 4: Final Report presented by Study Group Coordinator to Advisory Board for review and comments.
- Step 5: Final Report and comments forwarded to RVS Administration.

Phase V: RVS Status Reports

- Step 1: RVS Administration acts on recommendations.
- Step 2: TBT Conference for RVS Administration report to the Task Force and collect possible issues for study during next cycle.

One of the worst winters in recent history caused an extended delay in getting the Advisory Board together for their first meeting. This delay led to a much shortened time frame for orienting the Advisory Board to the project. Likewise, of three geographically distributed Task Force orientation meetings originally planned, only one combined meeting was held.

Several problems were encountered at the teleconferences with getting rooms and buildings open, equipment turned on, informing participants of meetings, as well as equipment problems. In addition, a lack of understanding by participants at all levels of their respective roles, frequent consumer absences from TBT and hospital teleconferences and the lack of a solid local organization contributed to the demise of the interrelated schedule of events and to diminishing consumer participation.

The project's problems were brought into high relief when the fourth talkback television conference (Phase III, Step 2) was not aired. A scheduling error left the main switching station unattended, resulting in no signal's leaving the station. Had the talkback TV conference been held, only about twenty consumers who were not Advisory Board members would have been in attendance.

A subsequent teleconference with the Advisory Board over the hospital teleconference network to discuss how to compensate for the January 20 conference was also not aired. Like the talkback TV conference, a mistake in scheduling left the main switching station unattended, forcing the cancellation of the teleconference. These two attempted conferences highlighted the two most evident symptoms of the problems faced by the project. These symptoms were: 1) Low consumer attendance; and 2) Problems in the coordination of activities with the agencies operating the telecommunications systems.

As a result, attention was abruptly focused on the need to rethink the project, both in terms of its goals and activities. The first step was to acknowledge that the project was not working as intended and secondly, to review and replan the project. A planning meeting was set for April 7, 1979, that would include RSA Regional Office personnel as well as representatives of the RVS Administration, RVS Field Staff, Advisory Board members and Consumer Task Force members.

The difficulties experienced in implementing Plan I came from many sources. Some of these problems reflect inconvenient weather and organizational problems while others reflect on the plan itself. In a nutshell, the plan required too much organization for the context in which it was applied. A second monograph, *Telecommunications for Concerned Citizen Involvement: An Attitudinal and Evaluative Review at a Time of Reassessment* (Westerheide, Bowerman, Collins and Hostetter, 1979), was produced to specify what went wrong and what might be done. The central focus in Monograph II was a survey of all project participants using the Telecommunications Project Participant Questionnaire.

The Telecommunications Project Participant Questionnaire addressed four areas of concern. The first area is concepts about policy-making power and participants' perceptions of the amount of policy-making power remaining at the state level. Secondly, the attitudes of participants toward the RVS Agency were investigated. The concern in these items was with the perceived overall effectiveness and decision making of the Agency.

The third area of concern is the participants' attitudes about consumer involvement in general and the extent to which the consumer should be involved in the policy-making process.

Finally, eight items and the four open-end questions are directed at evaluating the attitudes about the project's activities and of telecommunications for consumer involvement. The open-end questions were:

1. What did you like best about the project?
2. What did you like least about the project?
3. If you could change anything about the project, what would it be? How would you change it?
4. Do you have any other suggestions, comments or complaints?

Several important issues for the project's reassessment and subsequent improvement were inferred from the data provided by the Consumer Involvement Participant Questionnaire and other evaluation activities.

First, in spite of the difficulties experienced to date, all groups of participants (i. e. RVS Administration, RVS Facilitators, Consumer Advisory Board and Consumer Task Force) displayed strong support for what the project was trying to accomplish. In addition, participant ratings of the importance and need for consumer involvement activities were high.

Support for the RVS Agency in general was also indicated by the participants' ratings. All groups rated the RVS Agency as an "effective and valuable resource" for the handicapped. At the same time, all groups indicated that the RVS Agency "can do a lot more for the handicapped" than it is currently doing. Although definite changes needed to be made in the project, there seemed to be few residual negative attitudes toward the agency on the project. Rather, the ratings tended to indicate a basic agreement among the participants on the questionnaire items.

On fifteen of the twenty-five questionnaire items, Duncan's New Multiple Range Test indicated that the means of the four participant groups formed a single homogeneous subset ($\alpha = .05$). Range tests on the means of nine of the remaining items indicated two overlapping subsets of means.

The range tests identified two sharp and clearly distinct groups on only one item. This item was Item 1, "The really important policy decisions are made at the Federal level." The two subsets were composed of the RVS Administration and Consumer Advisory Board who tended to disagree with the statement and a subset composed of the RVS Facilitators and Consumer Task Force members who indicated agreement with the statement.

The differences in Item 1 separated the more central organization (RVS Administration and Advisory Board) from the "field" organization (RVS field staff serving as Facilitators and local Task Force members). Since the lack of participation by the Consumer Task Force has been a major concern, a part of the solution to the problem was seen to involve a clear indication of possible impact on important policy areas.

The participants' responses to the open-end questions on the questionnaire focused clearly on the immediate problems and possible solutions for the project. Here the central theme was the need for a better "grass roots" or local organization. The problems with the local organization were, in all probability, also strongly related to comments identifying a need for more organization, direction and communication. Participants' comments dealing with the need for local organization and more direction in activities even overshadowed the concern expressed about the problems with the telecommunications systems.

The difficulties with telecommunications were more organizational than technical, although technical difficulties did occur. All groups of participants cited the problems experienced with the telecommunications systems as a source of irritation. The scheduling of Saturday morning meetings also came under considerable fire with a preference mentioned for weekday evening meetings when an alternative was suggested.

The overall organization of the project was scrutinized by the participants for two additional reasons. First, several participants felt the project was too complex. The involved process of developing reports and recommendations and the later review and finalizing of the reports seemed to be beyond the scope of what might be expected from most consumers, especially consumers not otherwise involved in the rehabilitation movement. Secondly, the formalized structure did not allow sufficient time for immediate input and discussion by consumers about immediate issues bothering individuals.

Although the project has been only a limited success, it has been the source of a great deal of learning about the use of telecommunications for statewide consumer involvement. Thus, the experiences of the project during the implementation of Plan I formed the background for the April 7, 1979, reorganization meeting and the development of Plan II.

Development and Operation of Plan II

As previously explained, during February, 1979, we saw a critical need to confront several problems quickly that had arisen during the course of the first year's operation and to make any changes necessary in order to improve the effectiveness of our communications with each other. Our concern and eagerness to improve things led to a one-day workshop which was held April 7 in Oklahoma City. We wanted to insure that everyone was represented at this meeting. Therefore, representatives from the Administration, HEW Regional Office, Advisory Board, RVS Facilitators and Task Force participants were asked to attend. This workshop was held to evaluate all of the problems which had been identified and to develop a mutually agreed upon plan of action for remedying our mistakes and improving our efforts toward achievement of our goal.

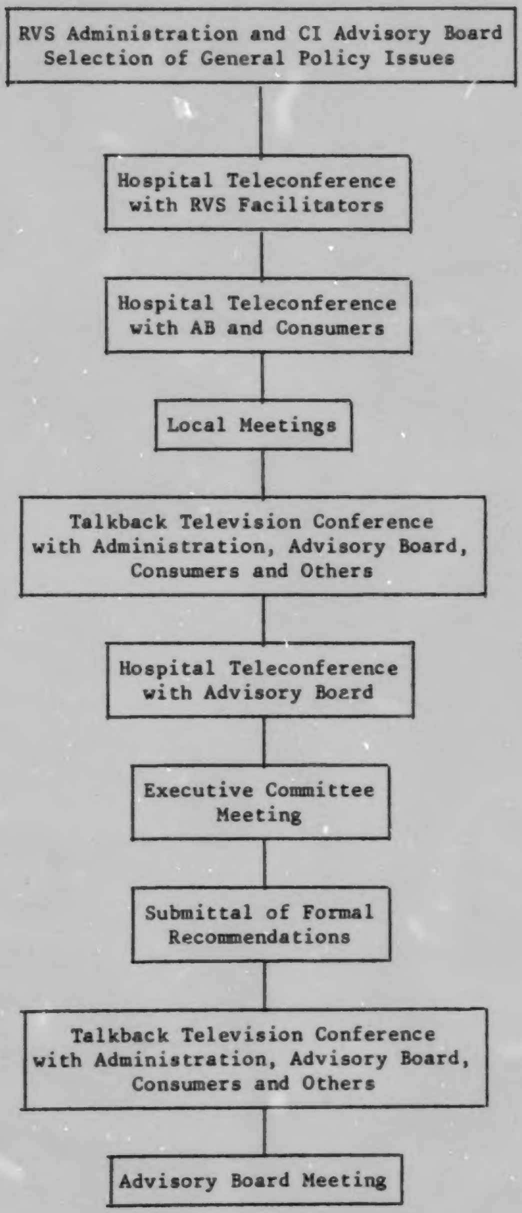
Thirty-six individuals attended this meeting and many positive changes were recommended. The optimism of many who attended was exhilarating for all of us. The Project Staff developed a consolidated report of all recommendations made that day and submitted it to the Administration for review. The Administration submitted to the Advisory Board a report approving most of the changes that had been recommended. This report was sent to the special committee which was formed from those who attended the April 7 meeting. The special committee met over the hospital teleconference system on May 31 to review both the results of the April 7 workshop and the administrative report. Final program changes were made and the results were mailed to all participants of the April 7 workshop. Preparations were made for a final workshop to be held over the talkback television teleconferencing system on July 16. Approximately twenty individuals representing all sectors of the project attended the teleconference to review and finalize the changes that were to take place during the final year and one-half of the project. All of this activity resulted in the development of a new plan of action.

The new plan of action may best be revealed through referring to Figure 2.

Figure 2 reflects seven primary events which needed to occur from July, 1979, through March, 1980. The first activity involved the Administration's selecting topics that need studying by participants (consumers, Advisory Board members, Facilitators, counselors, supervisors, etc.) of the project. The second event involved presentation of the study topics and changes within the project to the RVS Facilitators. This event took place through the hospital teleconferencing system on August 16. The third event involved holding the next hospital teleconference for all interested people to attend so that plans could be made for reviewing the study topics and gathering information with respect to each topic. This teleconference was held on October 11, and was an open meeting where the RVS Administration, Consumer Advisory Board, RVS Facilitators, consumers, organization representatives and other interested persons had an opportunity to discuss the study topics, form into study topic teams for purposes of working on these topics and develop a strategy for gathering as much information as possible regarding the topics. The fourth event involved the holding of local meetings. We felt that local meetings provided a critical link in the chain of events that would make our Consumer Involvement Project much more meaningful for everyone. We felt that local meetings would afford local interest groups, organizations, Facilitators, counselors, clients, Task Force participants and supervisors an opportunity to form alliance, discuss specific concerns and effectively gather information on study topics at the community level. We had hoped that local committee reports would have been developed for submittal to the Advisory Board so that plans could be made for further study of specific concerns. However, we found that while working through Plan II, Advisory Board members and consumers throughout the state simply did not have the required time in order to conduct local meetings in addition to the regularly scheduled hospital and talkback television teleconferences. This simply required too much of their already limited free time. Consequently, during the course of Plan II, most consumers, Advisory Board members and other interested persons continued to work on their own formulating their ideas gathering information and making recommendations at future teleconferences.

Figure 2

CONSUMER INVOLVEMENT PLAN OF ACTION


RVS Administration and CI Advisory Board Selection of General Policy Issues
Hospital Teleconference with RVS Facilitators
Hospital Teleconference with AB and Consumers
Local Meetings
Talkback Television Conference with Administration, Advisory Board, Consumers and Others
Hospital Teleconference with Advisory Board
Executive Committee Meeting
Submittal of Formal Recommendations
Talkback Television Conference with Administration, Advisory Board, Consumers and Others
Advisory Board Meeting

The fifth event involved the holding of a talkback television conference on November 17, 1979. This was an open meeting where anyone interested in attending was encouraged to do so. During the course of this teleconference, it had been planned for the Advisory Board members to present to the RVS Administration their initial report of findings regarding the three study topics that had been selected. Local community reports were to be addressed and opportunity was to be given for everyone to make comments and ask questions. In addition to this, it was planned for the Administration to discuss with those in attendance their decisions regarding the recommendations which had been made during Plan I of the project. Approximately fifty recommendations had been presented to the Administration regarding the first series of study topic issues and this was the time for the Administration to respond to those recommendations. Of the three hours allocated for this teleconference, approximately two and one-half hours were spent in the Administration's responding to the initial series of study topic recommendations. Considerable discussion took place and everyone seemed to feel that this was a very beneficial and rewarding teleconference. In fact, it appears that this was the best teleconference we have had to date, simply because consumers, Advisory Board members, Facilitators, other interested persons and the Administration were given considerable time to discuss in detail concerns that had been presented, recommendations that had been made and problems the Administration would have in solving some of those situations. This seemed to enhance both the understanding of the situations and concerns, both on the part of the Administration, as well as the consumers and others involved.

The sixth event involved the Advisory Board's conducting a hospital teleconference to review the substance of the November Talkback Television Conference and to develop a formal report for submittal to the Administration. This teleconference was held on January 16, 1980. During the meantime, minutes were typed up regarding the November 17 talkback television conference and detailed written reports were sent to all participants of the Consumer Project. It was recommended that they review the comments made on November 17 and provide any written responses they may have to the Project Staff. During the January 16 hospital teleconference, not only did the Advisory Board discuss the current study topics but also a member of the RVS Administration presented to them the Department's plans for independent living. During the course of this discussion, it was decided that an additional meeting would be required and should be held on February 1. This would provide the Consumer Advisory Board with an opportunity to study the Department's Independent Living Grant and to come to the meeting with comments and recommendations as to how the plan and grant might be improved on. Due to the fact that this meeting would be held during a weekday, it was decided that the Department would provide the consumers with a $75 consultant fee plus travel reimbursements.

The seventh event involved the Administration's receiving and acting upon the formal reports submitted by the Advisory Board. The Executive Committee of the Advisory Board met on February 6 to compile all of the information regarding the current study topics that had been obtained and to formalize a first draft of the formal recommendations that would be submitted to the RVS Administration. This report was sent to all Consumer Advisory Board members for review and comment and then formally submitted to the Administration. The Administration discussed the formal recommendations with all interested persons including Advisory Board members, Task Force participants, Facilitators, counselors, supervisors, etc., during a talkback television conference on May 3.

As stated earlier, the Consumer Involvement Plan of Action was developed as a result of communications between the Administration, Advisory Board, Facilitators and representatives from the Consumer Task Force. The basic changes within the program resulted in role changes for the Administration, Advisory Board and Facilitators. Role changes were considered instrumental in successfully achieving the agreed upon program modifications. The following provides the role identification for each group:

Administrative Role

1. To be responsible for making final decisions in relation to all aspects of the Consumer Involvement Grant.
2. To select some issues that will be studied by the Advisory Board and participants.
3. To be represented at all quarterly held talkback television conferences.
4. To make certain that comments are solicited from consumers when considering general policy matters and long-range planning goals providing sufficient time permits. (Occasionally, deadlines have been established which make it difficult to set aside time for meetings prior to the time allocated for completing the assignment.)
5. To work with the DISRS media representative in attempting to receive better media coverage with respect to consumer involvement activities in upcoming meetings.
6. To see that the Project Staff will provide Advisory Board members with travel and phone reimbursement.
7. To provide the Advisory Board and Task Force participants a response to reports and recommendations within a reasonable length of time.

Advisory Board Role

1. To be responsible for electing officers and will provide an adequate framework for replacing themselves following completion of the project in September of 1980.
2. To supervise the activities of participating consumers with respect to the study of issues, development of discussion papers, conducting of group meetings and submittal of final recommendations.
3. To screen and comment on all materials submitted for consideration by the Administration from field resources regarding the project.
4. To maintain contact with the Administration and Project Staff through frequent communication with the Advisory Board elected officials.
5. To be represented at all talkback television conferences and hospital conferences or locally held group meetings as indicated.
6. To conduct Advisory Board meetings once every four months.
7. To inform the Project Staff when additional help is required for particular situations where the RVS Facilitators' assistance is needed.
8. To submit recommendations and/or discussion papers in final form to the RVS Administration for review and comment.

9. To assist the RVS Administration and appropriate staff members in preparing agendas for upcoming teleconferences, workshops and group meetings.

RVS Facilitator Role

1. To maintain attendance records, manage reimbursement claims and assist participants at the local level.
2. To encourage counselors within their immediate area to keep past and present clients informed as to upcoming meetings and other consumer involvement activities.
3. To maintain frequent contact with Advisory Board members, consumer organizations and providers within their immediate areas with respect to consumer involvement project activities.
4. To assist Advisory Board members, Task Force participants and other interested consumers by serving as a resource person in assisting them in researching specific issues, determining facts and developing discussion papers or recommendations.
5. To actively maintain contact with Project Staff regarding activities taking place within their areas in relation to consumer involvement activities.
6. To assist the Advisory Board in holding local consumer meetings or workshops as needed.
7. To provide guidance and technical assistance as required to Advisory Board members and Task Force participants so that reports can be appropriately developed and submitted for consideration by the Administration.

Everyone concerned feels that the roles which have been identified for each group reflect the importance of each group's working cohesively together to realize success in achieving the goals of effective consumer involvement in policy development.

Current Study Topic Issues

The reason for evaluating our efforts at developing an effective plan for consumer involvement is to determine how policy issues can be looked at more effectively so that the net result of bringing improved services to clients can be achieved. During Plan II of the project, the issues to be studied were selected by the Administration plus one, a fourth issue, which was selected by the Consumer Advisory Board. Following is a list of these issues:

1. Determine effective ways for shortening the length of time required for a case to be accepted and services rendered.
2. Reduce the amount of paperwork required of a counselor and determine effective ways of eliminating the negative aspects of the quota system.
3. Determine more effective ways for transportation services to be provided in both rural and urban areas in order to assure adequate transportation for clients so that they have an opportunity to make necessary appointments.
4. Review economic need requirements for the delivery of RVS services.

As stated earlier, three teleconferences have been held regarding these issues and the Executive Committee of the Advisory Board met on February 6 to finalize the recommendations for submittal to the Administration. The RVS Administration will meet with all concerned on September 3 to review the recommendations and make comments.

Cost/Benefit Aspects

With respect to the cost of utilizing both the Talkback Television System and the Hospital Teleconference System as opposed to having everyone come to Oklahoma City for a conference, the following comparative information has been developed. On June 3, 1978, we invited all of the project participants, totaling 163 people to come to Oklahoma City for a six-hour orientation. The total cost for this meeting was $2,537.52, which equals $422.92 per hour. This cost included renting the facility, paying for interpreter, driver, attendant, meals, lodging and mileage. We have invited the same number of people to participate with us over the Talkback Television System for a total number of six times during the two and one-half years at a total cost of $5,452.90, which would equal $908.82 per meeting and $302.94 per hour. This includes rental of the Talkback Television System at $100 per hour plus payment to technicians, cameramen, as well as all of the cost items which were covered in the June 3 meeting. We have invited participants to meet with us ten times over the Hospital Teleconference System. These meetings have cost $76.08 per hour. This has included the $50 per hour rental of the equipment, as well as the costs associated with the June 3 meeting. As one can readily see, the cost of conducting such large meetings are dramatically reduced when the cost for lodging, meals and transportation expenses are diminished by reducing the amount of travel individuals are having to do. We also have found that people are much more interested in participating when they do not have to travel such long distances. Figure 3 provides a more comprehensive summary of our cost with respect to various systems used and types of meetings held.

Available Monographs

In many respects, consumer involvement in policy development has been enhanced with respect to the utilization of teleconferencing systems. As noted in this report, there are many problems that have confronted the project which have had to be resolved.

We have printed five monographs plus an executive summary regarding this project which provides you with detailed information regarding the administration of the project, the development of a policy consultation model, the development of research designs and evaluation procedures, and the results both from the perspective of the RVS Administration, Project Staff, Consumer Advisory Board, as well as consumers and other concerned and interested parties It you would like copies of these monographs, we encourage you to write Paul Bowerman, Department of Human Services, RS #24, Post Office Box 25352, Oklahoma City, Oklahoma 73125.

Figure 3

Cost/Benefit Analysis

TBT:	EQUIPMENT	PEOPLE
06-17-78 - 1st TBT	$ 700.00	$ 378.54
09-16-78 - 2nd TBT	700.00	377.90
12-16-78 - 3rd TBT	700.00	106.50
01-20-79 - 4th TBT	700.00	198.35
06-16-79 - 5th TBT	700.00	31.65
11-17-79 - 6th TBT	700.00	159.96
	4200.00	1252.90

$4200.00 + $1252.90 = $5452.90 ÷ 6 =
$ 908.82 ÷ 3 hours = $ 302.94 per hour

HOSPITAL SYSTEM:		
11-04-78 - Hosp. Tele.	150.00	327.55
03-08-79 - Hosp. Tele.	150.00	15.00
05-31-79 - Hosp. Tele.	150.00	31.65
07-24-79 - Hosp. Tele.	150.00	-0-
08-16-79 - Hosp. Tele.	150.00	-0-
09-11-79 - Hosp. Tele.	150.00	-0-
10-11-79 - Hosp. Tele.	150.00	27.78
10-17-79 - Hosp. Tele.	150.00	-0-
11-07-79 - Hosp. Tele.	150.00	-0-
01-06-80 - Hosp. Tele.	150.00	-0-
	1500.00	401.98

$1500.00 + $401.98 = $1901.98 ÷ 10 =
$ 190.20 ÷ 2.5 hours = $76.08 per hour

FACE-TO-FACE MEETINGS:		PEOPLE	PER HOUR
12-22-77	(6 hours)	$ 246.90	$ 41.15
02-22-78	(5 hours)	361.80	72.36
04-08-78	(4 hours)	297.90	74.48
05-10-78	(4 hours)	245.10	61.28
06-03-78	(6 hours)	2537.52	422.92
08-23-78	(3 hours)	31.05	10.35
10-21-78	(3 hours)	211.36	70.45
01-06-79	(3 hours)	8.25	2.75
		3939.88	

$3939.88 ÷ 8 = $492.49 per meeting;
$ 755.74 ÷ 8 = $ 94.47 per hour average

TELEPHONE CONFERENCING TO CONDUCT ADMINISTRATIVE APPEALS HEARINGS: REPORT ON AN EXPERIMENTAL EVALUATION IN-PROGRESS

By Jerome R. Corsi*, Gene D. Fowler**, Kathryn E. Newcomer***, and
Lawrence B. Rosenfeld****

This paper reports on an experimental research design currently being implemented in the field setting to examine the effects of telephone conferencing vs. in-person hearings in administrative appeals. The research has focused on hearings conducted by the New Mexico Employment Security Department (ESD) in the program area of Unemployment Insurance (UI) and by the New Mexico Department of Human Services (DHS) in the program areas of Aid to Families with Dependent Children (AFDC) and Food Stamps (FS).

In 1976, the idea to innovate occurred simultaneously to the New Mexico welfare agency, then the Health and Social Services Department, and the Legal Aid Society of Albuquerque. The welfare agency was experiencing time delay and considerable expense in the attempt to provide in-person hearings across the state to all clients who appealed adverse actions on their claims. The Legal Aid Society of Albuquerque was limited to providing legal representation only to clients in the Bernalillo County geographic area. Telephone hearings seemed a possible means for both groups to better achieve their service delivery aims. However, rather than simply implementing the innovation, assistance was sought from the University of New Mexico to obtain a social scientific evaluation on which a policy decision could be based. Specifically, serious questions had been raised concerning: (1) the extent to which telephone hearings met existing due process standards; (2) the cost-effectiveness of the technology; and (3) the effects of telephone conferencing on hearing quality.

In July 1977, the interdisciplinary research effort known as the Fair Hearing Project was first funded by the National Science Foundation. The initial phase of the evaluation involved the development and testing of a research design which culminated in a pilot test conducted in New Mexico during March and April, 1978.[1] The actual field experiment was begun in the following year. Because data collection will not be completed until May 1980, we are unable at this time to report findings and conclusions. However, this discussion will center upon: (a) the experience of implementing the field experiment in New Mexico; (b) the research design as planned and ultimately applied; and (c) the reaction to the innovation by the New Mexico agencies and other agencies which have explored telephone hearings.

1. Implementing the Field Experiment

While the complexities and practical problems initiating an applied experiment are well known, few reports describe field research management and operation.[2] To more completely understand this research effort, the reader is provided a brief overview of the field office which has performed the day-to-day implementation of the randomized design and the collection of data.

Prior to setting up the field office, the Principal Investigator and Field Office Manager arranged with the Contracts and Grants Office of the University of New Mexico (UNM) to set up accounts and establish authorized procedures for spending grant monies.[3] Once this was accomplished, the first task was finding suitable office space which was near both the agency headquarters and the University. Office space offered at the Employment Security Department was thought inappropriate if the project was to remain independent of the subject of investigation; adequate on-campus office space at UNM was unavailable. A suite was rented in downtown Albuquerque which contained enough floor space and isolated rooms to separate functions of the field office, e.g., telephone interviewers were physically separated from the activity and noise of the general office area.

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* Principal Investigator, Fair Hearing Project; Associate Research Professor, Department of Political Science, University of Denver, Denver, Colorado.

** Fair Hearing Project Field Office Manager, Albuquerque, New Mexico.

*** Assistant Research Professor, Department of Political Science, University of Denver, Denver, Colorado.

**** Professor, Department of Speech Communications, University of New Mexico, Albuquerque, New Mexico.

The second major task was to equip the field office under the financial restraints stipulated by granting agencies and current UNM policy: surplus goods which were available through UNM had to be considered before additional necessary items could be rented. Major equipment which could not be purchased by grant funds, e.g., typewriters, a copier, and file cabinets, were procured by the University and used by the field office for the duration of the project. Telephones posed a special problem: five separate lines had to be installed to allow for simultaneous interviewing, in addition to which three business lines were needed. New telephone lines - especially the eight placed in one suite - required more installing time and effort than originally planned because the building was not already equipped to accommodate a telephone system of this size. Equipping the field office, so that work could begin on the project took several months, however, the process of acquiring and maintaining equipment and supplies is on-going and changes with the demands of the research.

During the time the field office was rented and equipped, personnel were hired. First, the Field Office Manager hired a person to serve as liaison with the Income Support Division (ISD).[4] Next, office staff was hired, including a secretary, two transcribers, five individuals to function as both telephone interviewers and coders, and one in-person interviewer. The organizational structure as originally conceived had the Field Office Manager serving as the liaison with the Employment Security Department (ESD). Funding for conducting research with ISD was received later than initially expected,[5] therefore, the person hired to work as liaison with ISD was assigned to serve as liaison with ESD. When work with ISD finally began, the increased duties of the Field Office Manager required hiring an additional person. This new position, at first defined as liaison with ISD, was subsequently defined to include serving as coordinator for the lawyer experiment and as monitor for data filing procedures.

Once personnel were hired, training procedures were developed by the Principal Investigator, Field Office Manager, and ESD liaison. Based on a thorough consideration of the nature and goals of the Fair Hearing Project, the primary task of these three individuals was to become familiar with the agencies and translate the experimental design into a systematic set of practical research duties which could be applied to the daily on-going routines of two busy state agencies. After the development of these procedures, training of interviewers, coders, and office staff began.

Training included an orientation to the Fair Hearing Project, the specialized interview formats and coding forms used, and the filing and indexing system of case materials. Interviewers were first familiarized with the numerous interview schedules. Then, they practiced on each other, recorded their interviews, and received further instruction. Finally, they conducted telephone interviews during a three-month training period before the experiment began. Training continued throughout the experiment as instruments were modified and interview forms and new questions were added. For example, a "change of mode" interview was added to assess reasons for requested changes in random assignment of subjects to a telephone or in-person hearing condition. Interviewers were also trained as coders. This entailed familiarizing them with the various forms in the agency case files and the specialized coding sheets used for collecting data. During the three-month training period, research procedures were refined and tested. The experiment was officially implemented during September 1979.

Daily duties of the field office have included: random assignment of cases according to the research design; conducting interviews; coding interviews, case file materials, economic data, and verbatim transcripts of the hearings; and taping ISD telephone hearings (ESD hearings are taped by the Appeals Referees). A great deal of time is also required to coordinate the field office with UNM, ISD, ESD, the Legal Aid Society, and the Principal Investigator's office located at the University of Denver.

Special, nonrecurring duties of the field office include: adapting agency forms to reflect the introduction of the innovation; problem-solving; training agency personnel in the use of the telephone equipment and experimental procedures; and training Legal Aid Society of Albuquerque personnel in the use of the telephone equipment and how to adapt cases assigned in the experiment to their standard operating procedures.

The continued "setting up" of the field office requires flexibility. Translating an idea first spelled out in a written research proposal into the reality of an applied research project requires constant adaptation to a changing environment. To date, over 500 telephone hearings have been conducted as part of the training and experimental periods of the study.

2. The Research Design

The primary concern in this project is to evaluate the impact of the use of telephone conferencing vs. in-person hearings on the above mentioned three dimensions (perceived due process, cost-effectiveness, and hearing quality). The main treatment in the experimental design, therefore, is the use of a telephone call in place of in-person appearances at administrative hearings. The telephone treatment is conceptually simple, representing replacement of travel with a telephone call.

A second research interest focuses upon the interaction effects of legal representation and mode of hearing. Prior research and baseline data collected prior to and during the pilot study have established that hearings where parties have legal representation are longer and procedurally more complex, factors which theoretically could influence the conduct of a telephone hearing.[6]

In structuring our design for assignment of hearings, an important concern for hearing officers was taken into account. Will teleconferencing function similarly across the variety of geographical locations in which hearings are presently held? Hearing officers in New Mexico travel extensively to outlying areas, so the use of the telephone to limit circuit riding is an attractive alternative. The design was therefore blocked according to demographic areas, i.e., Albuquerque (the only New Mexico city with population in excess of 50,000), other urban areas, and rural areas. This addition to the experimental design resulted in a randomized block design to study the effects of the telephone treatment throughout the state (see Design 1 in Figure 1).

Due to practical and economic conditions, the lawyer/telephone effects are being studied in Albuquerque only. The lawyer/telephone interaction is thus implemented with Albuquerque cases in a randomized factorial design as depicted in Design 2 of Figure 1.

While the telephone treatment is conceptually simple, researchers when actualizing the intervention strategy often become aware that the treatment can be operationalized in several important different ways.[7] In this experiment, all parties other than the appeals officer might be speaking from one telephone at an agency area office (T_1) in an office telephone hearing. Alternatively, the parties could be speaking from phones at different locations convenient to each (T_2), a split telephone hearing.

Split hearing situations commonly arise in unemployment insurance cases when, for instance, a former employee moves (either intrastate or interstate) and files a claim against the initial employer. In such instances, current practice is to schedule two separate in-person hearings often conducted by two separate hearing officers (and in interstate claims, by a hearing officer in a distant "agent state"). Since split hearings were already part of the unemployment insurance current practice, both T_1 and T_2 were implemented. Telephone hearings offer genuine real-time confrontation between parties split by distance and intuitively seem to offer the prospects of a superior hearing. The welfare agency, however, in agreement with

Design 1

Areas	Telephone Treatments		
	T_1	T_2	T_3
Albuquerque			
Urban			
Rural			

Design 2

Legal Treatment	Telephone Treatments		
	T_1	T_2	T_3
Lawyer			
No Lawyer			

Where T_1=all parties except hearing officer in agency area office;
T_2=split telephone hearing;
T_3=normal in-person hearing.

Note: In the unemployment insurance lawyer experiment, clients are to participate in telephone hearings from the offices of the Legal Aid Society of Albuquerque, more closely approximating T_2 than if they were to assemble with the lawyer at a local claims office. Since local office personnel frequently participate in welfare hearings, the lawyers are planning to be with their clients at the local office (T_1) for these hearings.

Figure 1: Designs to Evaluate Experimental Effects of Telephone and Telephone-Lawyers Interaction in Unemployment Insurance Administrative Appeals.

HEW and the Food and Nutrition Service (FNS) sought only to test office telephone hearings. Local office welfare claims workers frequently participate in hearings (in contrast to unemployment insurance claims workers) and welfare clients commonly visit local welfare offices when filing claims. Additionally, the welfare officials involved felt office telephone hearings would ease problems of witness identification, submission and examination of documentary evidence, and observation of the oaths.

In defining the population of cases to be randomly assigned treatments, a key consideration was to ensure the generalizability of results. We needed a realistic population of cases from which to draw a sample. Since the experiment was to progress along with normal agency work schedules, we needed to be able to estimate the size of the population. A feasible portion of the state from which cases could be drawn was first identified by choosing for inclusion area offices with a reasonably high volume of appeals.[8] A second set of criteria involved choosing cases which fell into certain of the issues on which adverse actions are typically based. Issues, such as labor disputes, were excluded because of the lengthy testimony and numerous witnesses frequently present at such hearings.

In light of the significant policy implications of the test, selection of an adequate sample size for the experiment presented a critical decision. The desire to construct powerful tests of significant differences was our prime motivation in setting cell sizes. The estimated per-subject and length-of-experiment costs constituted the main constraints. The pilot study helped refine our estimates of both costs and feasible time frames for sampling, and led us to select sample sizes of 60 cases per cell as initial goals for fulfillment of the primary experiment in each of the three program areas.

3. Constraints on the Research Design Realized During the Experimental Period

Training research personnel and establishing a fully functioning field office took longer than anticipated, approximately nine months. Several dozen training cases were processed during this period, providing valuable experience as well as some data on the initial implementation. Still, the time spent in preparation reduced the time available for processing cases included in the experiment. Given that the first experimental cases were assigned in September 1979, eight months were allocated for data collection. To have planned on retaining an active field office capability beyond a May 31, 1980 deadline was seen as an unnecessary strain on available financial and time resources needed for analysis.

Several factors have influenced the actual implementation of the experimental test. The contracts with the four Federal agencies supporting this research were finalized at different times. This multi-stage funding affected the manner in which the experiment progressed: i.e., the experiment was implemented in stages corresponding to the flow of funding. Unemployment Insurance cases were processed first as part of the work specified in the National Science Foundation's continuation funding, and due to availability of funding from the Department of Labor. The AFDC appeals were then introduced into the experiment two months later following completion of arrangements with HEW. Food Stamp cases were not included in the experiment until January 1980, when it became clear that a contract would be received from FNS.

The introduction of the lawyer treatment was also delayed until the final four months of the experiment due to the availability of funding for the Legal Aid Society of Albuquerque. Money was designated for Legal Services in each of the awards. However, the Legal Aid Society, operating under its own case management constraints, waited until a contract could be written to cover the entire case load requested by the experiment. The agreements with the Legal Aid Society were finalized only after the NSF, DOL, and HEW awards had been received. The implementation of the lawyer treatment thus constituted a final stage in the completion of the experimental design.

Estimates of the number of cases meeting population specification criteria (i.e., case from an area office included in the study, and with appropriate issues) in each demographic area were extrapolated from previous case loads in all three program areas, unemployment insurance, AFDC, and Food Stamp hearings. The pilot study experience had demonstrated that we could anticipate a portion of cases selected into the experiment to drop-out. Drop-outs were expected to occur for one of three primary reasons: (1) the claimant withdrawing the appeal or failing to appear for the hearing; (2) treatment refusal; and (3) subject refusal of interview. The first category of drop-outs was taken into account by examining agency records indicating the number of scheduled hearings which are actually held. The second two types of dropped cases presented a potentially greater threat to the validity of the experiment. A research decision was made that when an assignment was refused (e.g., a claimant assigned a phone hearing requested an in-person hearing, or vice versa), that case would be dropped from the experiment and studied separately. The dropped case would be replaced by another case randomly selected and randomly assigned. Records have been kept on the cases dropped due to requests for mode changes or due to participant's refusals to be interviewed. Thus, threats to validity can be examined. Interestingly, not all requests for mode changes come from appellants originally assigned telephone hearings. In general, whereas mode changes at the beginning of the experiment were from a telephone mode to in-person, it appears as if now, six months later, the reverse may be occurring.

Given that we could expect drop-outs to occur, we knew that we would have to oversample to actually achieve cell size goals. Several schemes were considered to determine realistic sampling fractions for random selection on a weekly basis. However, the limited time frame for the experiment made these efforts unnecessary. Virtually all qualifying cases processed by the two agencies during the experimental period have been included in the test and randomly assigned according to the design outlined above.

Throughout implementing the test we have been limited by the actual case volume during the months of the experiment. As the experiment has progressed, a smaller volume in the number of hearings conducted in rural areas has hampered completion of these cells. At this time, the proportion of cases completed in the rural blocking considerably lags the completion rates in the other demographic blocks.

Completion rates for AFDC and Food Stamp cases are also somewhat lower than expected, even given (a) their late introduction into the experiment and (b) an appeals volume substantially lower than the volume in unemployment insurance. Thus, we have had to revise our expectations for cell sizes for ISD cases from 60 to 30.

The interaction between a later-than-planned introduction of the welfare cases and the assigned lawyers, a case flow which varies by geographic region, and a somewhat larger-than-expected number of mode changes has meant that target cell sizes will be approximated within the available experimental period as best as possible.

In facing the constraints which modified the original research plans, our primary goal has been to protect the internal validity of the experiment.[9] While of secondary importance, the question of external validity remains a concern. The interaction between selection of treatment and the treatment itself could potentially affect the generalizability of the results; thus, when analyzing data on dropped cases, relationships such as these will also be explored.

Following the completion of data collection, analysis and write-up is projected to continue until at least January 1981.

4. Reaction to the Innovation

Throughout the pilot test and the actual experiment, New Mexico agency personnel have been strongly supportive of our attempt to evaluate the innovation. Still, this does not imply that the agency personnel (especially at the day-to-day level of scheduling and conducting appeals hearings) either completely understand or totally accept the Fair Hearing Project. Members of the research team are often asked questions such as: "Why are you collecting information on in-person hearings when what you're studying is the use of teleconferencing?" "What's the difference between 'office telephone' and 'split telephone' hearings? They're both done over the phone, so what harm if we switch from one mode to the other?" "How is the random assignment done? What's the logic?"

While the data analysis has not yet been initiated, there are several indications that the agency personnel have found telephone hearings to be workable and of value. At the recent Conference on Telephone Hearings held in Portland, Maine,[10] Dean Harvel, ESD Chief Appeals Referee, described his experience with the innovation as follows:

"In New Mexico, about 60% of the U.I. hearings are conducted at locations outside of the metropolitan Albuquerque area. In order to hold hearings in the outlying areas the referee staff travels 50,000 miles per year. The time expended in traveling takes up about 1¼ referee positions or approximately 2600 hours per year. In addition to the distance problem in New Mexico, we are required, as are the other states, to meet stringent time lapse requirements which have placed an additional burden on our staff in that we are compelled to travel at frequent intervals with smaller caseloads in order to meet the time lapse criteria.

"In March and April of 1978, in conjunction with the Fair Hearing Project, a pilot study of telephone hearings was initiated during which some 70 hearings were held under the close scrutiny of the Fair Hearing Project staff. The results of the pilot study were extremely positive in that we found that telephone hearings were a workable alternative to in-person hearings. The scheduling and hearing procedures are somewhat more involved than in-person hearings; however, we found that both our referees and secretarial staff made the transition without any undue problems. The main difficulties we encountered were minor mechanical problems with the equipment and lines being busy for extended periods. Most of these difficulties were overcome through the assistance of the telephone company personnel and many of the minor problems were simply a matter of educating the staff to operate the equipment and to adjust to doing things differently."

Chief Appeals Referee Harvel noted that while his reaction had not always been positive, he now believes that telephone hearings will play a role in the appeals process:

"At the beginning of the pilot study most of the referees, including myself, were rather pessimistic and simply did not believe that telephone hearings were workable in our system. Part of this, I suspect, stemmed from the proverb that you can't teach old dogs new tricks. We had been holding hearings in a certain manner for so long that many of us were reluctant to try a new innovation. However, a few days into the study we found that the new system was workable and in short order our attitudes changed. In my opinion, teleconference hearings have a great potential in many areas of the U.I. adjudication process. The single most important is the capability of affording due process to both parties by making it possible for them to cross-examine, rebut, and confront their adversaries. This is in lieu of the current antiquated process of holding separate split hearings in different localities within the state and the entire country.

"In addition to the benefit of having all parties present, the advantage of cutting down on travel time, which is nonproductive and expensive, will also be of great benefit not only from a cost standpoint but will also be helpful in meeting the stringent time lapse standards imposed by the bureau. I do not advocate nor do I envision that telephone hearings will ever completely replace in-person hearings. There are certain instances in which telephone hearings may be neither practical nor feasible. However, I firmly believe that each state can successfully incorporate telephone hearings into their appeals procedure in varying degrees..."

In interviews conducted with the participant after each hearing in the study, there are numerous questions asked of participants designed to directly tap their feelings and opinions about their hearing. Below are examples of the questions asked together with an indication of some of the responses we have obtained.

The following question is asked of participants who have just completed an in-person hearing: Do you think this hearing could have been conducted over the telephone? Many participants believe their hearing could not be conducted well over the telephone: "It's too impersonal," "Face-to-face confrontation is necessary," and "Sometimes people say things over the telephone they wouldn't say in person - so face-to-face is better." A number of participants, however, thought there would be no problem over the telephone: "I wouldn't have been as intimidated over the phone," "I believe it would have been easier and just as fruitful over the telephone," "No problems - maybe I would have felt more at ease and had a better chance of winning," and "I don't see any difference - the facts are the facts." One person mentioned that the lack of visual cues might cut down whatever prejudice exists on the part of others participating in the hearing.

The following question is asked individuals who have participated in both in-person and teleconferenced hearings: Would you say that you act or behave differently in a hearing over the phone as opposed to a face-to-face hearing? Most participants indicate that they behave similarly in both types of hearings. Those who indicated there is a difference offered the following explanations: "I like face-to-face hearings - eye contact is important," "I explain more in person than over the phone," "Talking over the telephone is like talking to a wall, so I guess I behave differently." Favorable indications with regards to the telephone were also apparent: "I'm more relaxed over the phone - it's more informal," "It's more casual over the phone," "I felt it was more private over the phone, so I felt freer to say what I had to say," and "It's easier over the phone to refer to information I have on my desk. You don't have to be embarrassed in front of other people."

In 1970, the California Unemployment Insurance Appeals Board (CUIAB) began experimenting with the use of telephone conferences to conduct unemployment insurance appeals hearings.[11] Since then, the telephone hearing innovation has been expanded by the CUIAB as the normal procedure for conducting interstate and simultaneous divided hearings. Additionally, the telephone hearing is utilized by the CUIAB where travel difficulties place a hardship on one or more of the parties who would attend a normal in-person intrastate appeal hearing.

Speaking at the Portland Conference, Don Blewett, Chairperson of the CUIAB, had this to say about the use of teleconferencing in his state:

"California has eleven offices of appeals, conducting hearings in 133 locations throughout the state. All of the appeals offices and most of the hearing rooms in local department offices have permanent speakerphones or facilities to accommodate mobile speaker units. Because of the vast distances between department offices in the agricultural and rangeland areas of the state, the CUIAB recognized and began over ten years ago to utilize telephone hearings to accommodate parties who lived more than one hour's commute time from the nearest department office. Some department locations are so far removed and have so few appeals that with rare exceptions, phone hearings are utilized all the time. These hearings enable one judge to hear the testimony of all parties and witnesses at one hearing instead of holding individual separate hearings. Today, we regularly schedule interstate hearings involving single parties as well as two-party hearings with the employer and ALJ present in a California location, and the claimant in some distant location, either within the State of California or in some other state."

As Don Blewett noted, the only court decision discussing telephone hearings was supportive of the California innovation:

"If we had any doubt as to the feasibility of telephone hearings it was resolved when the California Court of Appeals decided the case of Slattery vs. California Unemployment Insurance Appeals Board (60 Cal. App. 3d 245, 131 Cal. Rptr. 422) in 1976. The claimant contended she was denied due process because she was unaware of certain of her rights, including the right to a telephone hearing. The Court commented very favorably on the use of phone hearings and noted specifically that telephone hearings are consistent with the requirement that the Unemployment Insurance Code of California is to be 'administered informally without resort to technicalities that might deprive the unsophisticated applicant of his right to benefits.'

"It is clear to me that telephone hearings do not result in a denial of due process; are a reasonable alternative to the live hearing where all parties are together (and note, I said, 'alternative'); and in this day of vast distances and fuel limitations giving rise to greater difficulties in maintaining transportation to remote areas, will be utilized in the future even more than they are today."

In two recent legal cases, the U.S. Department of Labor (DOL) has taken the position that telephone hearings can be a solution to difficult hearing situations. The first case, Okitkun v. Orbeck (1976), No. 76-8627, involved the Alaska Department of Labor in a suit filed by the Alaska Legal Services Corporation. This class action suit tested the constitutional and statutory validity of the Department's method of determining the location of unemployment insurance appeal hearings. Prior to this suit, Alaska held in-person appeals hearings at only five locations, namely the state's largest communities of Anchorage, Fairbanks, Juneau, Ketchikan and Nome. Appellants wishing to have an in-person hearing had to travel to one of these five locations; the option was to answer written interrogatories. The Alaska Legal Services Corporation contested on due process grounds that participant travel to these five limited locations constituted duress and that the written interrogatories were inadequate.

The Alaska Department of Labor and the Alaska Legal Services Corporation reached a negotiated agreement wherein the number of sites for in-person hearings would be expanded from five locations to eleven, and telephone hearings would be provided in other instances. DOL supported this agreement, noting that in the view of the Department of Labor, written interrogatories do not provide "an opportunity for a fair hearing" as required by Section 303(a)(3) of the Social Security Act (letter from Lawrence H. Weatherford, Jr., Administrator, Unemployment Insurance Service, Department of Labor, to Ronald W. Lorensen, Assistant Attorney General, State of Alaska, dated April 15, 1977). Travel to all areas in Alaska to hold appeals hearings presents enormous difficulties since there are many remote communities in Alaska with between 50 and 500 residents. Frequently the only means of transportation to such locations involves special chartered flights. Additionally, weather hazards and the unavailability of lodging for visitors makes hearing officer travel to many communities virtually impossible. On August 18, 1978, the negotiated agreement was accepted by the Alaska court.

A similar suit arose in a Puerto Rican case, Ferrer v. Marshall (1978), No. 78-745. The plaintiffs in this class action suit were represented by the Puerto Rico Legal Service, Inc. They argued that the Puerto Rican parties in the interstate split hearing were denied their due process rights to confront and cross-examine witnesses in the liable state. Once again, DOL approved a negotiated settlement which provided that a telephone hearing will be conducted in any interstate hearing involving a Puerto Rican claimant and a former employer who wishes to submit evidence. The negotiated settlement has been accepted by the U.S. District Court for the District of Puerto Rico.

Conclusion

The process of conducting a thorough and systematic social science evaluation involves painstaking effort, especially when the opportunity is present to utilize an applied experimental design, one of the most powerful social science methodologies available to estimate treatment effects. Given increasing national

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pressures to conserve energy and reduce governmental expenditures, the telephone conferencing innovation discussed here has drawn substantial interest and attention. Rather than yielding to the temptation to implement a solution which seems intuitively obvious, administrators on both the state and Federal levels have sought to have the innovation carefully examined before policy decisions are reached. The value of this approach is clear once one realizes that energy and cost savings are not the only goals in the appeals process. Additionally, legal standards of due process must be respected, participants must be satisfied that alternative hearing forms meet their needs, and the quality of hearings must be maintained if not improved by any system change.

In this brief discussion, we have attempted to provide the reader with an understanding of our research objectives and efforts to date. Now in the final stages of data collection, we plan soon to have a quantitative analysis to assist policy-makers in determining the future application of telephone conferencing technology in this area of administrative law.

Notes

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[1] For a detailed discussion of the pilot study, see: Jerome R. Corsi and Thomas L. Hurley, "Pilot Study Report on the Use of the Telephone in Administrative Fair Hearings," Administrative Law Review, Vol. 31, 1979, pp. 485-524.

[2] This point is developed in: Robert F. Boruch, "On Common Contentions About Randomized Field Experiments," in Robert F. Boruch and Henry W. Riecken (eds.), Experimental Tests of Public Policy, (Boulder, Colo: Westview Press, 1975), pp. 107-145; and H.W. Riecken and R.F. Boruch, "Social Experiments," in Annual Review of Sociology, Vol. 4, (1978), pp. 511-532.

[3] In January 1979, the Principal Investigator left the University of New Mexico and moved to the University of Denver. A portion of the NSF continuation grant was subcontracted to the University of Denver to provide for the Principal Investigator's office. Through the continued cooperation of the University of New Mexico, the remainder of this grant was utilized for the operation of the field office in Albuquerque. This move made more complicated than usual the initial establishment of grant accounts and spending procedures.

[4] In April 1978, mid-way through the pilot study, the New Mexico Department of Human Services was formed, consolidating what previously had been separate agencies. Prior to this reorganization, the Food Stamp and AFDC welfare programs were administered by the New Mexico Health and Social Services Department (HSSD), and the unemployment insurance program was administered by the New Mexico Employment Security Commission (ESC). Under the combined organization, what was HSSD became the Income Support Division (ISD) and what was ESC became the Employment Services Division (ESD). Each Division retained a separate General Counsel's office identical to the General Counsel's Office in the original separate agencies. No change occurred in either the personnel conducting fair hearings or the hearing procedures. In 1979, prior to the full implementation of the experiment, the agencies were again separated; this time into the New Mexico Employment Security Department (ESD) and the New Mexico Department of Human Services (DHS). The Income Support Division (ISD) of the Department of Human Services assumes immediate responsibility for implementing welfare programs.

[5] As the above note on funding makes clear, grants from HEW and the Food and Nutrition Service (FNS) were received after grants from NSF and the Department of Labor (DOL). Thus, initial plans called for limiting the experiment to unemployment insurance cases; an expansion of the test to welfare AFDC was contingent upon HEW contributing to the research, and the inclusion of food stamp appeals depended upon a funding decision by

FNS. Implications of the funding dates upon research design modifications are discussed in Section 3 of this paper.

[6] See, for instance: Robert G. Dixon, Jr., Social Security Disability and Mass Justice: A Problem in Welfare Adjudication, (New York: Praeger Publishers, 1973); William D. Popkin, "The Effect of Representation in Nonadversary Proceedings - A Study of Three Disability Programs," Cornell Law Review, Vol. 62, 1977, pp. 989-1048; and Jerry L. Mashaw, et.al., Social Security Hearings and Appeals, (Lexington, Mass.: Lexington Books, 1978).

[7] Riecken and Boruch, "Social Experiments," op.cit., p. 514.

[8] The following counties were excluded from the study because the baseline data indicated we could expect low case loads and thus a poor return on research resources: San Juan, Rio Arriba, Sandoval, McKinley, and Valencia.

[9] Donald T. Campbell and Julian C. Stanley, Experimental and Quasi-Experimental Designs for Research, (Chicago: Rand McNally College Publishing Co., 1963).

[10] Conference on Telephone Hearings, Portland, Maine, August 13-15, 1979. Sponsored by the U.S. Department of Labor. David Bustin, Commissioner of the Maine Department of Manpower Affairs, Chairperson. Jerome R. Corsi, Program Chairperson.

[11] For a more complete report on the use of telephone hearings by the California Unemployment Insurance Appeals Board, see: J.R. Corsi and T.L. Hurley, "Attitudes Toward the Use of the Telephone in Administrative Appeals Hearings," Administrative Law Review, Vol. 31, 1979, pp. 247-283.

IMPACT OF TELECONFERENCING ON THE CHURCH AND CHURCH MUSIC

Edward O. Hugdahl
Professor of Music and Chairman
University of Wisconsin Extension Music Department
Madison, Wisconsin

Teleconferencing has tremendous potential for church music. All segments of church music leadership, besides music leadership, can also benefit greatly by using teleconferencing.

In the past three years the University of Wisconsin Extension Music Department has added offerings in church music to its total program offered through teleconferencing. The principals of distance learning,[1] which are utilized when teleconferencing is used, have been adapted to teach and meet the needs of church music. The intent of this paper is to describe and analyze these efforts.

In 1973 the University of Wisconsin Extension Music Department made its first tentative steps in using teleconferencing by offering just one program. Venturing into a completely new and uncharted field for music created doubts and apprehensions as well as sidelines of skeptics. The tentative steps made with that one program created confidence to explore and experiment with more programs in music and more clientele groups in music.[2] For the 1980-1981 year there will be eighteen programs throughout the academic year using teleconferencing which are designed for various clientele groups in music with a wide variety of program emphases.

The University of Wisconsin Extension Music Department is in the unique position of being able to use the most extensive and sophisticated educational teleconferencing system in the world, the University of Wisconsin-Extension Educational Telephone Network (ETN). Being able to use such a system with its elaborate fidelity equipment has made it possible to do the varieties of music programming so far attempted. These efforts would be totally impossible without the tremendous and cooperative technical support absolutely essential to make these music programs a reality; the engineering staff literally have pressed the system to its limits to accommodate the demands of teaching music.

Music teaching on Wisconsin's ETN began with offerings for piano teachers. Then the teachers of spinet organ were added as another clientele group. A comprehensive, year-long program for teachers of music in elementary and secondary schools was then inaugurated. For another effort a semester-long graduate course in music education was begun for additional professional development of music educators. Efforts in 1979 were started to reach teachers in day-care, pre-school and nursery school settings with offerings on teaching music to the pre-school child.

Statistics of Churches and Church Music in Wisconsin

Using teleconferencing to focus on the needs of church musicians in Wisconsin was begun in 1977. This was prompted because of the following conditions. Of the approximately 4.4 million people in Wisconsin 70% are affiliated with some religious group. These affiliations are as follows: Roman Catholic - 48%; Lutheran - 32%; Methodist - 7%; United Church of Christ - 3%; Presbyterian - 2%; Baptist - 1.5%; Episcopal - 1.3%; Jewish - 1%; others - 5.2%. These denominations are organized into some 4,000 churches: Catholic - 934; Lutheran - 1,427; Methodist - 604; United Church of Christ - 285; Presbyterian - 180; Baptist - 163; Episcopal - 135; Jewish - 40; others - 221.[3] National statistics indicate that 33% of the members in the major denominations are in 8% of the churches.[4] Hence, of the 4,000 churches in Wisconsin most are small in size and membership and resources.

It is estimated that there is less than one half of one per cent of the 4,000 churches in Wisconsin with a full-time director or minister of music. It is also estimated that between 20% to 30% of the churches have choir directors and organists with a collegiate degree in music. The vast majority of music leadership is therefore amateur and with varying amounts of musical background and training.

With some 4,000 churches in Wisconsin it can be conservatively estimated that there are at least 4,000 organists and perhaps more, since usually a church has at least one organist and some have an assistant or two. Most churches have at least one adult choir and one or two children's and youth choirs, usually directed by different people. Hence, it can be estimated that there are about 8,000 or 9,000 choir directors active in churches in Wisconsin.

It is a known fact that there is more live music performed each week in the churches in the United States than in all of the concert halls in the country combined.[5]

Backed with these statistics and conditions efforts were begun to focus on the needs of church musicians using teleconferencing. An additional condition unique to church music is that opportunities for continuing education are not as numerous and prevalent as those available to music educators in the elementary and secondary schools.

Children's Choirs in Churches

Because teleconferencing proved successful for working with choral directors in the program offerings for high school music educators, the first effort for church musicians was for directors of children's choirs. Since the flexibility of teleconferencing makes it possible to draw upon the nation's finest talent, two outstanding specialists in working with children's choirs with nationally respected reputations presented the first series in church music for a two session offering in November 1977 from 6:30-7:50 p.m. Helen Kemp is professor of music at the prestigious Westminster Choir College in Princeton, New Jersey; Betty Ann Ramseth is a specialist with children's choirs and widely published composer of children's music living in Sacramento, California with her clergyman husband. Through teleconferencing it was possible to have these widely acclaimed authorities have state-wide impact from each coast of this country and never set foot in the state of Wisconsin. This first endeavor attracted an enrollment of 226 choir directors scattered throughout 75% of the counties in Wisconsin. In no other way could there be such state-wide impact with this talent.

The second offering for children's choir directors was in October 1978. The scheduling for that series of three sessions was from 4:30-5:50 p.m. The enrollment that year was 102 dispersed throughout 45% of the counties in the state. There were many requests received that an offering like this be scheduled in the evening because this late afternoon time conflicted with children's choir rehearsals the directors were having in their own churches at that very time, as well as employment schedules. The three specialists involved in this series were: Victor Hildner, Professor of Music and children's choir specialist at Concordia Teachers College, River Forest, Illinois; Dale Wood, Music Editor of Sacred Music Press and widely published composer of church music now living in The Sea Ranch, California, and formerly director of the distinguished church music program at St. Mary the Virgin Episcopal Church in San Francisco; and Eileen Jones, Associate Minister of Music of Music at the very large First Baptist Church in Huntsville, Alabama, and in great demand for children's choir workshop.

The third offering for children's choir directors was in October 1979. For this series it was scheduled from 7:30-8:50 p.m. on three consecutive Monday evenings. An enrollment of 97 was dispersed through 46% of the counties in the state. Once again from three parts of the country specialists with children's choirs had opportunity to reach all corners of a state. John Burke is Executive Director of the very influential Choristers Guild in Dallas, Texas, and widely acclaimed for his work in church music; Evelyn Phillips is Professor of Church Music at the Southwestern Baptist Theological Seminary School of Church Music in Fort Worth, Texas; and Avis Evenrud is a children's choir specialist in Edina, Minnesota, presently directing the children's choirs at the prestigious Central Lutheran Church in Minneapolis.

An evaluation form similar to that in Appendix III was used to evaluate this series. With a 36% return Table I indicates reactions to this series. Some of the comments articulated by the participants in this 1979 series are as follows:

> "Enabled you to listen to someone from another part of the country and learn from them, not only by listening, but also by input of your own." (Barron, Wisconsin) (Lutheran)

> "All three sessions introduced me to ideas I had not thought of before. This is an excellent way to bring people from all over the country to people all over the state." (Waukesha, Wisconsin) (Lutheran)

> "Ideas from three different sources - unlike a college course with one professor. Many good ideas. Too short! Could have used a

Table I

1979 Children's Choirs in Churches

Rating of Each session and the Entire Series On a Scale of 0 (low) to 9 (high)

	NA	0	1	2	3	4	5	6	7	8	9
First Session (Burke)	8%						8%	11%	20%	23%	30%
Second Session (Phillips)	2%			3%	3%		14%	6%	12%	34%	26%
Third Session (Evenrud)					3%		3%	5%	12%	20%	57%
Entire Series	3%						3%		23%	48%	23%

longer series. A lot of us need a lot of help or have a lot of questions." (Neenah, Wisconsin) (Catholic)

"Close to home. Convenient location. High quality instructors." (Fond du Lac) (Catholic)

"It not only gave many ideas and techniques, but it gave us a vision to work toward with our choirs." (Edgerton, Wisconsin) (Lutheran)

"The opportunity in asking questions and having them answered seems to provide the most practical information. Avis Evenrud seemed especially to speak from present-day experiences, really focusing on needs of the choir and choir director. Her enthusiasm was catching." (Waupaca, Wisconsin) (Lutheran)

"Reaffirms what's been learned in the past and rekindles ideas that have been forgotten. Was a fine series." (Madison, Wisconsin) (Presbyterian)

"Practical goals and objectives and methods to achieve them. All three seemed aware of varying abilities of the children in church choirs (including uncertain singers and large age span) and offered practical suggestions for working with these children. It has also helped reinforce my feelings of the importance of helping foster the musical and spiritual growth of each child, while working with others who feel the best 'performance' is the ultimate goal." (Monroe, Wisconsin) (United Church of Christ)

Small Church Choirs

For three Monday evenings in September and October 1979 from 8:00-10:00 p.m. a series was presented called, "Small Church Choirs: Don't Give Up!" This was specifically designed to meet the needs of the many volunteer and amateur choir directors there are in churches in Wisconsin. The three teachers for this series have been involved in an annual series of two day summer workshops which are taken into four regions of the state each summer for the past twelve years. In addition to the author of this paper the three-man team also consists of Arthur Cohrs, Professor of Music, University of Wisconsin-Green Bay, and Arlyn Fuerst, Minister of Music at Trinity Lutheran Church, Madison, Wisconsin. Since these three teachers have been teaching together for twelve years in this most unique state-wide endeavor in church music, it was possible to design the offering so that Prof. Cohrs originated in Green Bay and the two in Madison originated from the choir room in Trinity Lutheran Church with a demonstration group of singers from that church's choir. This series was looked upon by the teaching staff as a new avenue to reach this clientele group of amateur and volunteer church musicians to whom they are dedicated in serving each summer in face-to-face workshops. It was carefully planned so that each member of the team had portions to present each session. There were 104 enrolled in this series scattered throughout 64% of the counties in the state.

The evaluation form used for this series is in Appendix II. With a 25% return Table II indicates reactions to this series. Some of the comments from the participants of this series on Small Church Choirs are as follows:

"Excellent over-all guidelines given for beginning choir directors by men who understand the initial problems." (South Milwaukee) (Catholic)

"Detail given to practical matters. An honest look at the small choir situation. Planning of material covered and time devoted to each was well-done." (Cochrane, Wisconsin) (Lutheran)

"Excellent presentation and very practical! The speakers were all very enthusiastic." (Oshkosh, Wisconsin) (Catholic)

"I felt it covered the basic steps to orga-

Table II

1979 Small Church Choirs: Don't Give Up!

Rating of each session and the series
On a Scale of 0 (low) to 9 (high)

	0	1	2	3	4	5	6	7	8	9
First Session				4%	4%	12.5%	4%	12.5%	30%	33%
Second Session						12.5%	16%	12.5%	22%	33%
Entire Series					4%	12.5%	8%	21%	25%	30%

nizing and running a church choir. The examples given were clear and easily adapted for my use. I especially enjoyed the discussion on chant and on uses of the hymnal." (Superior, Wisconsin) (Catholic)

"Lots of new ideas for use of available materials. Your enthusiasm is contagious - like a good Sunday sermon all three of you inspire us to keep plugging away." (Black Creek, Wisconsin) (Methodist)

"There was encouragement even for those of us who have very little experience with church choirs. The actual singing with just a few people sounded great and emphasized the point that there does not have to be many to lead the congregation in song and praise. I like the point made that singing is our way of offering our praise to God." (Lac du Flambeau, Wisconsin) (Catholic)

"This was super for me as you can tell by the rating above. It's the sort of shot in the arm I needed. I thought it was well planned and divided between teachers and topics." (Port Washington, Wisconsin) (Catholic)

"It covered many important aspects of singing and group participation. Very informative and interesting. Although I am the organist and not the director, the information I received from this course will be very beneficial if I ever have to take over when the director is absent." (Park Falls, Wisconsin) (Catholic)

Small Church Organists

As a companion series to "Small Church Choirs: Don't Give Up!" in February 1980 from 10:00-11:50 a.m. a two session series was presented called, "Small Church Organists: Lots Can Be Done!" While all three of this church music team in Wisconsin are organists just Arlyn Fuerst and this author presented this series in order that both could be together at the same organ console. Since this was a new endeavor being in Madison close to technical support was also desirable. Never before has an attempt been made with teleconferencing to work with church organists. There were 114 enrolled in this series scattered throughout 65% of the counties in the state.

A similar evaluation form to that on the church choir offering was used. With a 25% return Table III indicates reactions to this series. Some comments volunteered by participants for this series for Small Church Organists are as follows:

"The series was excellent in helping me understand the organ better. As I am one of these people who has been playing piano and not organ, the thing intimidates me even more than the thought of the congregation trying to follow me. Thank you." (Centuria, Wisconsin) (Lutheran)

"Numbered lists were helpful for notetaking. General principles were good with such a diverse group. Emphasis on the purpose of music to glorify God was super." (Osseo, Wisconsin) (Lutheran)

"I thoroughly enjoyed the series and would enjoy more workshops. I felt the series really related to me." (Sharon, Wisconsin) (Lutheran)

"Very practical and informational. Appreciated tremendously remarks on wedding and funeral music." (Madison, Wisconsin) (Lutheran)

"Gave me confidence that it's o.k. to play just the manuals. Made me more knowledgeable. I've never had organ lessons as such and I learned a lot." (Ladysmith, Wisconsin) (Lutheran)

"The suggestions for teaching new hymns were most valuable. Also methods of registration very good. Musical examples helpful during discussion." (Walworth, Wisconsin) (United Church of Christ)

Table III

1980 Small Church Organists: Lots Can Be Done!

Rating of each session and the series
On a Scale of 0 (low) to 9 (high)

	NA	0	1	2	3	4	5	6	7	8	9
First Session	7%				7%	3%	3%	3%	22%	22%	33%
Second Session	7%					3%	3%	7%	7%	33%	40%
Entire Series	10%					7%		7%	14%	22%	40%

"Warm, understanding, patient and clear teachers and showed strong convictions on the importance of music in the church. Views regarding what is appropriate, permissible or not in church music...weddings and funerals. Showed knowledge of all types of small organs." (Almond, Wisconsin) (Lutheran)

"Helps to understand difference between organ and piano. Helps to understand that music is indeed important in church services so everyone can glorify and praise God in song." (Athens, Wisconsin) (Lutheran)

"It really seemed to speak to our situation. Affirms what I'm trying to do. Kept going, little repetition of points, covered so much. Handout very good, can look back to it." (Cross Plains, Wisconsin) (Lutheran)

"Helpful to me as a pastor to understand why I like or don't like a piece of music during worship." (Menominee, Michigan) (Methodist)

"Thank you for a very informative lesson. You both deserve a Gold Medal." (Arkansas, Wisconsin) (Reorganized Church of Jesus Christ of Latter Day Saints)

Hymns of the Church

There have been two attempts to present offerings on the topic of hymnody. In February and March 1979 this author presented a two session offering on Wednesdays from 1:30-3:00 p.m. called "Cultural Roots in the Hymnody of the Church." The intent of this offering was to give an overview of hymns as used in the various denominations in Wisconsin.[6] There were 130 enrolled in this series scattered throughout 50% of the counties in the state.

A similar evaluation forum tc that in Appendix I was used. With a 16% return Table IV indicates reactions to this series. Some of the comments from participants on this series on hymnody are as follows:

"The well organized outline of a difficult subject matter. The ecumenical manner in which Prof. Hugdahl approached the subject. The knowledge of the subject-matter." (Manitowoc, Wisconsin)

"This series was a complete overview of the subject. The second session was especially very well done with good examples." (Polar, Wisconsin)

"Great care and detail put into the prepared sheets (the survey, bibliography, history)." (Elkhart Lake, Wisconsin)

"Very stimulating. Makes one want to learn more and take a better look at his own church music."

"Good historical survey. Excellent printed material supplied with the series." (Eau Claire, Wisconsin)

"Background knowledge of teacher, outline and resource material and questions from participants are strengths of this."

"The first session was informative about the use of hymnals and music in worship and helpful to me as I look at the use of music in worship." (Green Bay)

The second attempt in the field of hymnody so far was made in September 1979 on two Tuesdays from 10:00-11:50 a.m. called "Hymns: Dump Them or Sing Them." This was presented by the international celebrated The Reverend Professor Dr. Erik Routley, presently on the faculty of Westminster Choir College in Princeton, New Jersey. He is the most widely published and praised scholar in the field of hymnody in the world today. Difficulties in getting the brochure promoting this series through the printer and the mails did not provide enough lead time to promote this series. The enrollment of 36 was scattered throughout 25% of the counties in the state.

Denominational Participation

Separation of church and state is always a concern for a state institution like the Univer-

Table IV

1979 Cultural Roots in the Hymnody of the Church

Rating on each session and the series
On a Scale of 0 (low) to 9 (high)

	0	1	2	3	4	5	6	7	8	9
First Session					14%		9%	20%	24%	24%
Second Session		5%				5%	30%	20%	15%	15%
Entire Series						23%	4%	20%	34%	15%

sity of Wisconsin when working in the field of church music. A defensable rationale on this church and state issue is that the University of Wisconsin is committed to serving the state; it serves various segments of society such as business, labor and agriculture. The church is also part of society with as many needs as business, labor and agriculture. The expertise of the University of Wisconsin can be drawn upon by the church, but all offerings must be available to all denominations. Every effort is made to design all offerings so they are applicable to all denominations. The length of time some of the offerings have been supported by the citizens of Wisconsin indicates that they do serve all denominations; for example, the series of workshops on "Music in the Small Church" which are taken into various regions of the state each summer are now in their twelfth year. For three of the offerings described above there was a place on the registration blank to indicate the denomination of the church for which the participant was providing music. The statistics in Table V indicate the broad denominational participation; the participation can also be related to the denominational affiliations in Wisconsin cited above.

Teleconferencing Experience and Attendance Factors

The University of Wisconsin Educational Telephone Network began in 1965. The UW Extension Music Department began programming in 1971. In 1978-1979 some 34,000 students enrolled in a variety of programs on the University of Wisconsin Educational Telephone Network. It has been the experience of the University of Wisconsin Extension Music Department that as each new clientele group was added to its program offerings the data indicates that teleconferencing has never been experienced by over half of the participants. This data, of course, indicate that one must constantly educate people about teleconferencing and its potential and that one can never become complacent in this new and emerging force for education. Table VI details this information.

Attendance in adult education endeavors always is a challenge, and especially so when the offerings are for non-credit. Table VI also details the attendance rate for the indicated programs.

Transmission of Music

For teaching purposes music is transmitted at an amazing fidelity on the University of Wisconsin Extension Educational Telephone Network.

In the series for children's choirs musical examples were pre-recorded and then played from ETN central control in Madison. Greater fidelity in transmission is achieved when this procedure is followed. People who teach music are used to having their tape recorder at their finger tips when teaching, rather than a half a continent away. Initially this is a bit unsettling, since in this emerging field of distance learning musicians have not taught in this manner before. However, after the first request for a tape example is successful those apprehensions fade. Choir directors have gained greatly by hearing recorded examples of music and children singing.

Table V

Denominational Affiliation of Participants

	1979 Small Church Choirs: Don't Give Up!	1979 Children's Choirs in Churches	1980 Small Church Organists: Lots Can Be Done!
Lutheran	38%	46%	35%
Catholic	27%	11%	11%
Methodist	9%	10%	11%
Baptist	5%	1%	2%
United Church of Christ	3%	3%	7%
Presbyterian	3%	7%	4%
Episcopal	3%	2%	4%
Evangelical Free	2%		1%
Community Church	1%		
Reformed Church		2%	
Church of Nazarene		1%	
Assembly of God		1%	
Christian Science			1%
No indication given	9%	16%	26%

Table VI

Previous Experience Using ETN and Attendance Factors

	1979 Small Church Choirs	1979 Children's Choirs in Churches	1979 Small Church Organists
Previous Experience Using ETN	24%	40%	36%
No previous experience with ETN	76%	60%	64%
Willing to use ETN again	92%	100%	93%
Not willing to use ETN again	4%		7%
No Answer	4%		
Attendance			
All Sessions in Series	88%	86%	89%
First Session only	12%		
Second Session only		6%	11%
Third Session only		8%	

For the series on small church choirs the origination was from the choir room of a Madison church. There were three adult women and three adult men forming a small choir for demonstration. Additional instruments like recorder, tambourine and triangle were also used. The pickup and transmission of this demonstration were exceptional.

The origination of the sessions for the small church organist was from a Madison church. Here, again, the transmission of the organ sound was at an amazing fidelity for teaching purposes. From this experience it was learned that very low pitches played in the pedal were not as clear as desired. However, this was not a crucial factor, for having an organ to demonstrate with that clientele was so helpful, and that slight limitation could be easily worked around.

Organizational Details

In Appendices I, II, III and IV there are examples of material from the series, "Small Church Choirs: Don't Give Up!", which are used in promotion and teaching.

Appendix I is an example of the brochure announcing the offering. This is a simple promotional piece, photographically reduced to fit on a standard 8½x11' piece of paper and designed to be a self-mailer. The brochure copy is written to appeal to the clientele and highlights of each session are given to aid in promotion participation. Future offerings are also listed to gain additional advertisement. The self-mailer panel is also used to give the title, date and times of the offering as another eye catching device.

Appendix II is an example of the welcoming letter sent to each participant along with the materials. Because each offering has 50% to 60% of the participants new to ETN an explanation of the system is given.

Appendix III is an example of the outline of the presentations. This is found helpful so that participants can see how the offering is structured. This technique has proven helpful in this field of distance learning.[7] Additional materials sent to the participant are listed at the bottom of the outline so they can check to make sure everything has been received.

Appendix IV is an example of the simple evaluation form that is used for these programs. While frequently many people are alone at their ETN Listening Location, this device makes them feel part of this state-wide classroom that is linked together in a most intricate way. Such reactions are invaluable to gain insights for future directions and program emphases.

Summary

There is a tremendous need to provide continuing professional educational opportunities for church musicians, especially those in small church situations. The statistics indicate that the vast majority of churches are small and most of the church musicians in small church situations are volunteers and amateurs. With such vast numbers of church musicians and limited opportunities available in church music workshops there is a tremendous potential for programming in this field.

The experience in Wisconsin has proven

that it is possible to use teleconferencing for church musicians. It has also proven that it can be effective.

Because of the great needs of the small church it is desirable to focus programming for that segment. In Wisconsin the approach was one of developing program offerings for clientele groups within the small church: (1) directors of children's choirs; (2) directors of adult choirs; (3) organists; (4) clergy and laity interested in hymnody.

The data indicate that teleconferencing is effective in meeting the needs of church musicians. Also, from this data it is learned that there is an exceptional attendance rate for adult education. While teleconferencing began in 1965 in Wisconsin it is still unknown to many citizens in Wisconsin. Once they experience teleconferencing they see its tremendous potential of bringing resources to remote regions of the state.

Footnotes

1. Monson, Mavis. "A Report Investigating Teaching Techniques Used Over the Educational Telephone Network, University of Wisconsin-Extenson." A Design for Interactive Audio, edited by Mavis Monson, Lorne Parker, Betsy Riccomini, Madison: Instructional Communications Systems, University of Wisconsin-Extension, 1977, pages 1-37.

2. Hugdahl, Edward O. "Distance Learning in Music Through The Teleconferencing Principle: A Six Year Experience in Wisconsin On A State-wide Basis." ERIC ED 168 534

3. Wisconsin Council of Churches data.

4. Schaller, Lyle E. "Music in the Large Church." Choristers Guild Letters, Volume XXXI, Number 7, March 1980, pages 123-125.

5. American Music Conference data.

6. Hugdahl, Edward O. "Impact of Technology on Hymnody." The American Organist, Volume 14, Number 1, January 1980, pages 30-31.

7. Baird, Marcia. "Designing Teleconference Programs: Some Clues From the Wisconsin Experience." The Status of the Telephone in Education, compiled by Lorne A. Parker and Betsy Riccomini, Madison: Division of Educational Communications, University of Wisconsin-Extension, 1976, pages 41-50.

ETN Locations: There is at least one location for this program in each of the towns checked below. If the town nearest you is not checked, *look for other towns in your area* that are offering this program.

- [✓] Alma, 685-4560
- [✓] Antigo, 623-7601
- [ ] Appleton, 735-5119
- [✓] Ashland, 682 2804
- [✓] Baldwin, 684-3301
- [✓] Balsam Lake, 485-3136
- [✓] Baraboo
  - [✓] Courthouse, 356-5581
  - [ ] UW Center, 356-8351
- [✓] Barron, 537-3124
- [ ] Beloit, 755-2195
- [✓] Black River Falls, 284-5391
- [✓] Chilton, 849-2361
- [✓] Chippewa Falls
  - [ ] Courthouse, 723-9195
  - [✓] Library, 723-1146
- [✓] Crandon, 478-2212
- [✓] Darlington, 776-4494
- [✓] Dodgeville, 935-3354
- [✓] Durand, 672-5214
- [✓] Eagle River, 479-4797
- [✓] Eau Claire
  - [ ] Courthouse, 839-4712
  - [✓] Library, 839-5002
  - [ ] UW Campus, 836-3289
- [✓] Elkhorn, 723-4900
- [✓] Ellsworth, 273-4376
- [✓] Florence, 528-3218
- [✓] Fond du Lac, 921-5600
- [✓] Friendship, 339-7811
- [✓] Green Bay
  - [ ] Courthouse, 497-3216
  - [✓] UW Campus, 465-2139
- [✓] Green Lake, 294-6573
- [✓] Hayward, 634-4876
- [✓] Hudson, 386-5581
- [✓] Hurley, 561-2697
- [✓] Janesville
  - [ ] Courthouse, 755-2195
  - [✓] UW Center, 755-2195
- [✓] Jefferson, 674-2500
- [✓] Juneau, 386-4411
- [✓] Kenosha
  - [✓] Health & Soc Ser Cntr, 656-6793
  - [ ] UW Parkside, 553-2312
- [✓] Keshena, 799 3641
- [✓] Kewaunee, 388-2542
- [✓] La Crosse
  - [✓] Courthouse, 785-9593
  - [ ] Library, 784-8623
  - [ ] UW Campus, 785-8900
- [✓] Ladysmith, 532-5539
- [✓] Lancaster, 723-2125
- [✓] Madison
  - [ ] Fairgrounds, 266-4372
  - [ ] Library, 266 6388
  - [✓] Radio Hall, 262-4342
  - [ ] Wis Center, 262-1122
- [✓] Manitowish Waters, 543-8417
- [✓] Manitowoc
  - [ ] Co Off Bld., 682-8877
  - [ ] Library, 682-6861
  - [✓] UW Center, 682-8251
- [✓] Marinette
  - [ ] Courthouse, 735-3371
  - [✓] UW Center, 735-7477
- [✓] Marshfield, 387-1147
- [✓] Mauston, 843-1341
- [✓] Medford, 748-3327
- [✓] Menasha, 734-8731
- [✓] Menomonee Falls, 251-4030
- [✓] Menomonie, 232-1636
- [✓] Merrill, 536-7151
- [✓] Milwaukee
  - [✓] Civ Cntr Campus, 224-1960
  - [✓] UWM Library, 963-4954
- [✓] Mondovi, 926-4201
- [✓] Monroe, 325-5181
- [✓] Montello, 297-2141
- [✓] Neillsville, 743-3118
- [✓] New Richmond, 246-2364
- [✓] Niagara, 251-4698
- [✓] Oconto, 834-5322
- [✓] Oshkosh
  - [✓] UW Campus, 424-0050
  - [ ] Library, 424-0486
  - [ ] UWEX Sunnyview Complex 424-0050
- [✓] Park Falls, 762-3121
- [✓] Phillips, 339-2555
- [✓] Plain, 546-4201
- [✓] Platteville, 342-1244
- [✓] Plymouth, 459-3717
- [✓] Port Washington, 284-9411
- [✓] Portage, 742-2191
- [✓] Prairie du Chien, 326-6431
- [✓] Racine, 553-2312
- [✓] Rhinelander, 362-6314
- [✓] Rice Lake, 234-8176
- [✓] Richland Center, 647-6148
- [✓] River Falls, 425-3256
- [✓] Shawano, 526-6136
- [✓] Sheboygan
  - [✓] UW Center, 459-3717
  - [ ] Library, 459-3400
- [ ] South Milwaukee, 762-8692
- [✓] Sparta, 269-6718
- [✓] Spooner, 635-3192
- [✓] Stevens Point, 346-3573
- [✓] Sturgeon Bay, 743-5511
- [✓] Superior
  - [✓] Courthouse, 394-0363
  - [ ] UW Campus, 392-8101
- [✓] Tomahawk, 453-2181
- [✓] Viroqua, 637-2166
- [✓] Washburn, 373-2221
- [✓] Waukesha
  - [ ] Courthouse, 544-8080
  - [✓] UW Center, 542-8825
- [✓] Waupaca, 258-7681
- [✓] Wausau
  - [ ] Courthouse, 842 2141
  - [✓] UW Center, 845-9602
- [✓] Wautoma, 787-4631
- [✓] Wauwatosa
  - [✓] Co Ext Off, 257-5351
  - [ ] Library, 258 5700
- [✓] Webster, 866-4201
- [✓] West Allis, 476-6550
- [✓] West Bend
  - [ ] Courthouse, 334-3491
  - [✓] UW Center, 338 1161
- [✓] Whitehall, 538-4341
- [✓] Whitewater, 472-1100
- [✓] Wisconsin Rapids, 423 3000
- [✓] Woodruff, 356 5222

ETN Program No. E122

SMALL CHURCH CHOIRS: DON'T GIVE UP!
Mondays, September 24 and October 4, 1979—8:00-10:00 p.m.
Via ETN in every county in Wisconsin

UWEX
UNIVERSITY OF WISCONSIN–EXTENSION
Extension Music
Of Arts Development
610 Langdon Street
Madison, Wisconsin 53706

Nonprofit Organization
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Madison, Wisconsin
Permit No. 1425

APPENDIX I

UWEX
UNIVERSITY OF WISCONSIN–EXTENSION
Extension Music
In cooperation with
Wisconsin Music Teachers Association

presents

SMALL CHURCH CHOIRS:
DON'T GIVE UP!

Two Mondays
September 24 and October 1, 1979
8:00-10:00 p.m.
Via ETN in every county in Wisconsin

REGISTRATION FORM

SMALL CHURCH CHOIRS: DON'T GIVE UP!

Please enroll me in this ETN course beginning at **8:00 p.m. on Monday, September 24, 1979.** Enclosed is my check or money order for $10.00, payable to *UW-Extension.*

I wish to attend the sessions at the ETN location in:

____
(name of town from list on back panel)

Name ______________________________

Street ______________________________
(or rural route and box number)

City ______________ State ________ Zip ________

Phone (*area code*) ______________ *daytime number*

Name of Church Providing Music For:

____

Social Security Number ______________________
(Providing your Social Security Number is voluntary. By providing it, however, you help ensure the completeness and accuracy of your transcripts. Your number will be used only to identify and to maintain your record of courses or program completions.)

MAIL TODAY: ETN Registrations
101 Extension Building
432 North Lake Street
Madison, Wisconsin 53706

UW- Extension provides equal opportunities in employment and programming including Title IX requirements.

SMALL CHURCH CHOIRS: DON'T GIVE UP!

Churches with modest and limited resources play significant roles in the lives of individuals and communities everywhere. The small church choir is of crucial importance to the worship life in these parishes. Practicality is the emphasis for this series. No matter the situation there are always ways to improve. Choirs can sound better and some simple approaches can do wonders. Rehearsals can be turned from a drag to a delight. A poor balance between men and women need not be a disaster. One can live creatively and imaginatively on limited budgets. Essential is planning for an effective and integral use of the choir in the worship structure of the parish.

Session I—Monday, September 24, 1979—8:00-10:00 p.m.
Choirs, no matter how small, are essential in worship
Small can be beautiful
Getting singers to make better use of their voices:
  Better sounding choirs result
Lots of overlooked material that really fits small choirs
Untapped resource: A new look at the hymnal

Session II—Monday, October 4, 1979—8:00-10:00 p.m.
A bit of organization can do wonders
A fresh look at promoting participation
Making rehearsals come alive
Four Advent Hymns
Principles of chanting
Planning ahead in the Church Year

Instructors

For eleven years in an unprecedented massive effort to assist in meeting the needs of music in the small-church situation Arthur Cohrs, Arlyn Fuerst and Edward Hugdahl have crisscrossed the state. Their commitment and dedication to this mission and their spectacular team teaching have evoked enthusiastic plaudits from church musicians and clergy of all denominations everywhere. *Arthur Cohrs* is Professor of Music at UW Green Bay; *Arlyn Fuerst* is Organist-Choirmaster at Trinity Lutheran Church in Madison; and *Edward Hugdahl* is Professor of Music and Chairman of the UW-Extension Music Department in Madison. To these ETN sessions these three bring a wealth of practical experience and background in church music as choir directors, organists and church music specialists.

GENERAL INFORMATION

Dates: Mondays, September 24 and October 4, 1979 - 8:00-10:00 p.m.

Registration Fee: $10.00. No partial enrollments are accepted. Checks are to be made payable to *UW-Extension.*

Note: This registration fee and costs including travel, meals and lodging incurred in participating are valid professional expenses for income tax purposes to maintain and improve professionals skills. (See Treas. Reg. 1.162-5; Coughlin v. Commissioner, 203 F .2d 307.)

Notification: Notification of registration will be sent immediately.

Credit: Completion of SMALL CHURCH CHOIRS: DON'T GIVE UP! merits receipt of 0.4 Continuing Education Units (CEU). Reports confirming CEUs earned will be sent to participants at no cost within two months. Participants may wish to use these CEUs earned as supporting evidence of professional continuing education in the certification programs.

Information: For additional information contact Edward O. Hugdahl, UW-Extension Music, 610 Langdon Street, Madison, Wisconsin 53706. Telephone: (608) 263-2954.

Local Information: By calling the UW-Extension Local Program Administrator at the number indicated after the ETN location's listing additional information may be obtained.

Note: To insure the availability of the ETN site you select, your registration *MUST be received by September 17, 1979.* If you register after that date, call the number listed after the site you wish to attend for registration information.

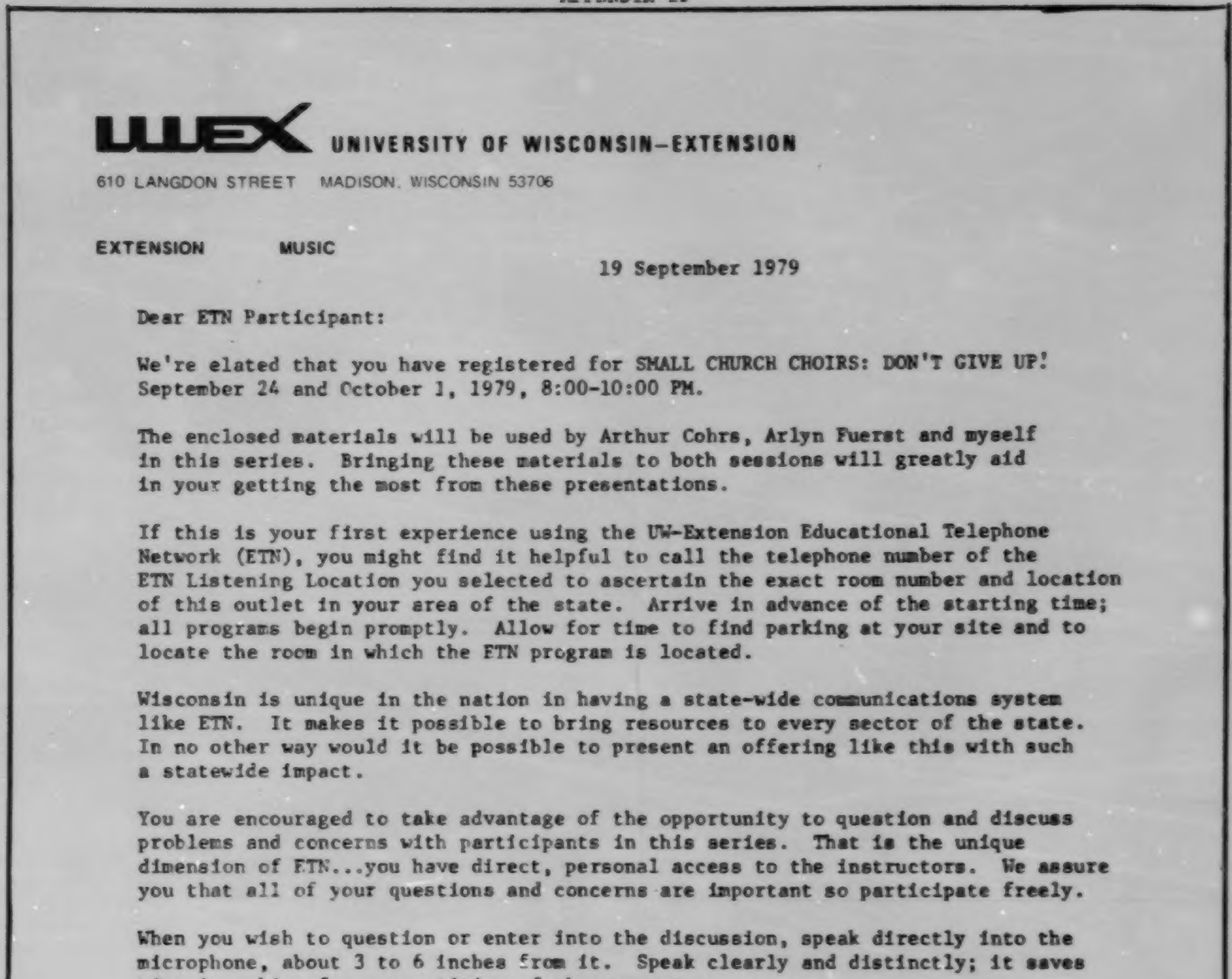
FUTURE UW-Extension Music Offerings for Church Musicians on ETN

Children's Choirs in Churches
October 8, 15 and 22, 1979—7:30-8:50 p.m.
John T. Burke, Choristers Guild, Dallas, Texas/*Evelyn Phillips*, S. W. School of Church Music, Fort Worth, Texas/*Avis Evenrud*, Children's Choir Specialist, Edina, Minnesota

Small Church Organists: Lots Can Be Done!
February 20 and 27, 1980—10:00-11:50 a.m.
Arlyn Fuerst, Trinity Lutheran Church, Madison, Wisconsin/*Edward Hugdahl*, UW-Extension Music

Psalmody: Roots, Traditions and Use in Today's Churches
April 14 and 21, 1980—10:00-11:50 a.m.
Keith Schoville, UW-Madison Dept. Hebrew and Semitic Studies/*Edward Hugdahl*, UW-Extension Music

APPENDIX II



UWEX UNIVERSITY OF WISCONSIN–EXTENSION
610 LANGDON STREET MADISON, WISCONSIN 53706

EXTENSION MUSIC

19 September 1979

Dear ETN Participant:

We're elated that you have registered for SMALL CHURCH CHOIRS: DON'T GIVE UP! September 24 and October 1, 1979, 8:00-10:00 PM.

The enclosed materials will be used by Arthur Cohrs, Arlyn Fuerst and myself in this series. Bringing these materials to both sessions will greatly aid in your getting the most from these presentations.

If this is your first experience using the UW-Extension Educational Telephone Network (ETN), you might find it helpful to call the telephone number of the ETN Listening Location you selected to ascertain the exact room number and location of this outlet in your area of the state. Arrive in advance of the starting time; all programs begin promptly. Allow for time to find parking at your site and to locate the room in which the ETN program is located.

Wisconsin is unique in the nation in having a state-wide communications system like ETN. It makes it possible to bring resources to every sector of the state. In no other way would it be possible to present an offering like this with such a statewide impact.

You are encouraged to take advantage of the opportunity to question and discuss problems and concerns with participants in this series. That is the unique dimension of ETN...you have direct, personal access to the instructors. We assure you that all of your questions and concerns are important so participate freely.

When you wish to question or enter into the discussion, speak directly into the microphone, about 3 to 6 inches from it. Speak clearly and distinctly; it saves time in asking for a repetition of the comment.

If you ever wish to contact me, call the local ETN location listed in your area and inform that office that you wish to speak to me; ask them to relay this message to me; I will then call you at no cost to you. If at any time you wish to submit questions in writing, we'll also be pleased.

It would be greatly appreciated if you would return the enclosed evaluation form on this series after the second session. Taking a few minutes to reflect on it, as well as indicating additional areas and concerns which might adapt themselves to this communications system would be most beneficial.

The UW-Extension Music Department is most anxious at all times to hear of your needs and concerns. Always feel free to contact us at any time.

Art, Arlyn and I are looking forward to your participation in SMALL CHURCH CHOIRS: DON'T GIVE UP!

Sincerely,

Edward O Hugdahl

Edward O. Hugdahl
Professor of Music ~~and~~ Chairman
UW Extension Music Department

Enc.

APPENDIX III

SMALL CHURCH CHOIRS: DON'T GIVE UP!

Monday, September 24, 1979 - 8:00-10:00 PM

I. Choirs Are Crucial for Corporate Worship

II. Regardless of Your Numbers Choirs Can Sound Better: Some Practical Approaches

III. Practical Materials and Approaches for Small Groups of Singers

IV. The Hymnal: An Untapped Resource and a Great Budget Stretcher

Monday, October 4, 1979 - 8:00-10:00 PM

I. Getting Organized and Getting Participation

II. Turning a Rehearsal from a Drag to a Delight

III. Another View on Materials

IV. Chant is Easy. Chant is Effective. Chant is a Boon for the Small Choir.

V. Plan for Worship. Plan for Action.

Materials Included:

1. Ecumenical Praise, Edited by Carlton R. Young, Published by Agape, Carol Stream, Ill.
2. Journal of Church Music, September 1979, Volume 21 Number 7
3. Warm-up Exercises for Choirs (page 1)
4. Hymns (pages 2, 3, 4)
5. Chant (page 5)
6. Rehearsal Technique Tips (page 6)
7. Canons (pages 7, 8, 9, 10)
8. Selections from Ecumenical Praise

EVALUATION OF "SMALL CHURCH CHOIRS: DON'T GIVE UP!"

Septemver 24 and October 4, 1979

1. Check sessions attended _____No. 1 _____No. II
2. Have you participated in ETN offerings in the past _____Yes _____No
3. Would you be interested in participating in future ETN courses? _____Yes _____No
4. Denomination of your church_______________________________
5. On a scale of 0-9 (low to high) indicate your overall evaluation of the first session: ______
6. On a scale of 0-9 (low to high) indicate your overall evaluation of the second session: ______
7. On a scale of 0-9 (low to high) indicate your overall evaluation of the entire series: ______
8. Indicate strengths of this series:
9. Indicate weaknesses of this series:
10. Indicate topics and personnel (if known) for areas or issues for future programming on ETN in music education.

Return to: Edward O. Hugdahl
UW-Extension Music
610 Langdon Street
Madison, WI 53706

THE AIR FORCE INSTITUTE OF TECHNOLOGY
TELETEACH EXPANDED DELIVERY SYSTEM EXPERIMENT

G. Ronald Christopher
Chief, Plans and Evaluation Division
Air Force Institute of Technology
Wright-Patterson Air Force Base, Ohio 45433

Background

The rapid growth of knowledge and the increasing sophistication in technology offer a significant challenge to educational institutions. This challenge is quite evident within the Air Force Institute of Technology (AFIT), which is responsible for providing undergraduate, graduate, and professional continuing education to the Air Force, and in certain content areas, the Department of Defense (DOD). AFIT accomplishes its mission objectives through resident instruction at Wright-Patterson AFB and various types of nonresident instruction.

In the specific area of professional continuing education (PCE), neither manpower nor facilities have kept pace with the need. In the 1978-79 academic year alone, over 7,000 students received professional continuing education in resident courses - less than 45% of the 15,000 who needed resident PCE that year.

Resident PCE is designed to foster intense concentration while minimizing the time students are absent from their duty stations. Course length ranges from three days to ten weeks. Instruction occurs during a 6-7 hour class day, five days a week. Many blocks of instruction are presented by functional experts who are not assigned to the AFIT faculty. They teach as guest lecturers in courses designed and managed by the permanent faculty.

Nonresident professional continuing education is provided through seminars, workshops, on-site offering at the students' location, and correspondence courses. Approximately 10,000 students are instructed annually in these modes. More requests for nonresident education exist than AFIT can accommodate.

Meeting the education demand poses a dilemma. How can AFIT provide education to more students in existing courses and concurrently develop new courses without increasing either the number of faculty or overall instruction cost?

This dilemma is particularly evident in the School of Systems and Logistics. Numerous courses have 2-3 year student backlogs, while numerous requests are pending for new courses. Faculty are restricted in the amount of time available for course development due to heavy commitments in providing instruction in existing courses.

Limited physical facilities both within AFIT and at WPAFB, limited faculty, and limited budget preclude a solution based upon increased resident student attendance. Expansion of current modes of nonresident instruction is also limited, since an increase would require additional faculty, increased travel, and increased support personnel.

During the search for a resolution of this dilemma, use of the telephone as an educational delivery system was considered. Since 1973 both the Civil Engineering School and the School of Systems and Logistics have routinely used commercial dial-up telephone services to provide limited length (1-2 hrs) instruction to single remote locations. Teleteach or Telelecture was the name given to this delivery mode.

Recent technological advances in telecommunications now offer expanded capabilities. In early1979 American Telephone and Telegraph began commercial marketing of a device which can transmit, through telephone lines, material written upon an electronic blackboard and regenerate the writing at distant locations on a standard TV monitor. The electronic blackboard offers a significantly expanded capability to the use of the telephone for educational purposes.

Further research into the educational viability of telephonic instruction revealed that over 37 telephone networks now convey instruction to civilian students who are remote from the point of origin. The most common network patterns are within specific states or within limited geographical areas. The acknowledged leader, the University of Wisconsin, serves over 35,000 students annually through its statewide telephonic network.

Telephonic networks generally convey content to serve practicing medical, legal, and agricultural professionals as well as students in agronomy, business, engineering, and mathematics. As yet, there has been no indication that any content discipline is unsuitable for telephonic transmission. Some programs offer academic credit, others meet professional continuing education requirements, while others carry no formal credit. Program length varies somewhat, with the majority adhering to the advanced education schedule, i.e., one to two hours a day, one to two days per week.

Research has shown consistently that learning is not significantly affected when telephonic instruction is compared to traditional classroom instruction. An excellent review of the literature is provided in Myrless Hershey's dissertation, A Comparison of the Effectiveness of Telephone Network and Face-to-Face Instruction for the Course "Creative Classroom," Kansas State University, Manhatten, Kansas, 1977.

The success of telephonic networks in the civilian sector and AFIT's previous limited use of the medium strongly suggested that a dedicated telephonic delivery system using the electronic blackboard might offer the solution to our need to educate more people within current resources.

AFIT administrators identified courses within the School of Systems and Logistics where significant student backlogs existed. These courses are designed to meet the requirements of essentially two major Air Force Commands, the Air Force Logistics Command (AFLC) and the Air Force Systems Command (AFSC). The majority of potential students are stationed at a limited number of bases.

Following an AFIT proposal, both commands agreed to establish a telephonic network with classrooms at specified bases. Command participants agreed to share the cost because the system would permit students to receive needed instruction while working part time and remaining at the work location. No travel and per diem costs would be involved. A preliminary cost analysis indicated that the cost of the delivery system could be offset if approximately 360 students received instruction without incurring travel and per diem expenses. Additionally, the student backlog could be rapidly eliminated, since instruction provided at AFIT to a regular class of 24 students could be received by approximately 120 additional students at AFLC sites and 96 additional students at AFSC sites. This could occur without additional faculty or facilities.

Subsequently, two dedicated telephonic networks were installed in September 1979. One network connects AFIT with five Air Logistics Centers (ALCs) and a second network links AFIT with four Air Force Systems Command (AFSC) locations.

Sites are geographically dispersed throughout the United States and encompass all time zones. Using the two separate networks, two courses can be offered simultaneously: one for the AFLC sites, and one for the AFSC sites. Each course originates from a separate classroom at AFIT. The originating classrooms and each remote site classroom are connected through two pairs of dedicated telephone lines. One pair sends and receives verbal expressions, while the other pair transmits writing generated upon the electronic blackboard. Each site is able to transmit as well as receive. Therefore, presentations may originate from any site. Necessary visuals, in the 35 mm slide format, are made available to each site and may be controlled by the presenter. All verbal and blackboard written communication during each class is recorded on stereo-audio tape. Replay of classroom sessions is at the discretion of each site monitor.

Consideration of the time zone differences and normal resident class scheduling resulted in an expanded Teleteach schedule of daily four hour system use from 12:00 to 4:00 p.m. EST. Presentations originating at AFIT are made before a student audience employed at Wright-Patterson AFB, Ohio. Ten-minute class breaks occur each hour.

The additional capabilities available in this Teleteach approach -- the electronic blackboard, dedicated lines, and recording of classroom sessions, combined with AFIT's previous Teleteach/Telelecture delivery mode -- suggested labeling this new delivery system Teleteach Expanded Delivery System (TEDS).

Course Description

These courses provide the data used in the evaluation of the Teleteach Expanded Delivery System.

The Materiels Management Course, Log 220

This course is designed to improve the management effectiveness of key personnel assigned to Materiel Management and related AFLC activities which provide support to the Air Force and other DOD agencies. It is intended to familiarize the student with the structure, philosophy, policies, functions, processes and systems of Air Force Logistics, with particular reference to their impact on Materiel Management.

Student eligibility is predicated upon course director approval of a standard form. Students usually range in grade from captain to lieutenant colonel and civilian grades GS 09-14. The Log 220 course contains 96 student contact hours. The instructional format is basically lecture, with allowance for student questions. A simulation exercise, involving teams of five students, serves as a culminating experience. Class size ranges between 22-28. A large number of guest speakers make presentations in this course.

The Fundamentals of Acquisition Management Course, Sys 326

This course is designed to provide an overview of the management process by which USAF systems are acquired and in particular the role and responsibilities of the program office as they relate to the acquisition process. Students receive instruction involving the Air Force Systems Command, the acquisition process, the budget process, the program office, engineering management process, the contracting process, integrated logistics support, program control, the management review process, and the interrelations with other Air Force Commands.

This 60-hour course is intended for persons recently assigned to acquisition management positions. Although the great majority of students are lieutenants, some higher ranking officers and NCOs also attend. Civilians ranging in grade from GS 05-14 are eligible. This course was given for the first time using TEDS. The instruction format is basically lecture and discussion. Most instruction is provided by AFIT personnel, although several guest speakers are involved.

The Principles of Contract Pricing Course, QMT 170

This course provides a basic understanding of cost and price analysis policies, procedures, techniques, and negotiation strategy.

This course is sponsored by DOD and is mandatory for civil service employee progression in the contracting career field. Persons in the comptroller career field also constitute a significant portion of class enrollment. Eligibility is predicated upon successful completion of a Mathematics Screening Evaluation and acceptance by the course director of a standard form. Military students range in grade from second lieutenant to colonel, while civilian grades range from GS 05 to GS 14. Normal classroom enrollment is 25. This 98-hour, three-week course is presented numerous times annually through resident instruction at WPAFB and onsite where sufficient student numbers warrant. AFIT faculty conduct the QMT 170 course. Instruction occurs within a problem-solving format where students apply mathematical formulae to various pricing situations. An integrating problem involving student teams serves as a culminating experience.

Differences

The manner in which AFIT employs its telephonic delivery system raises several distinctive concerns which have not been addressed by published research.

We must consider the nature of the influence upon students of a four-hour, five-day a week class schedule. Most available research depends upon class schedules of 1-2 hours a day, 1-2 days per week. The effect of numerous speakers vs one or two during a course offers another challenge to available research findings. We need to measure the effect of time of day when instruction is received, and we need to identify the impact of remote classroom supervision by persons who are unfamiliar with course content upon student performance and system acceptance.

These factors, both individually and in combination, insist that a thorough evaluation be conducted and preclude a priori system acceptance based upon currently available research.

Research Questions

A comprehensive evaluation is being conducted in which these research questions are being addressed:

Are student groups (control/experimental) comparable in terms of education level, grade/rank, age, and entry level knowledge?

What effect upon academic achievement did the TEDS have compared to resident and on-site delivery of the same courses?

What differences in academic achievement occurred between resident student groups receiving instruction face-to-face with the presenter and student groups receiving instruction without face-to-face presentations when both groups used the TEDS?

To what extent was the TEDS acceptable to students, their supervisors, presenters, visitors, and site monitors?

To what extent did students and their supervisors consider course value to be significantly different when resident on-site and TEDS instruction occurred?

To what extent did students and their supervisors consider the TEDS schedule acceptable?

Does the cost of the TEDS exceed that of resident instruction on a per capita student basis?

The Evaluation Plan

The evaluation plan permits acquisition of data to determine if the Teleteach Expanded Delivery System is acceptable educationally, affectively, and financially. Data are being collected to reveal (a) learner accomplishment, (b) learner, supervisor, and presenter system acceptance, (c) system functional reliability, (d) visitor impressions, (e) interaction among sites, and (f) system cost. Several uses of the TEDS with several different courses provide data for analysis.

The effectiveness of the delivery system will be determined through these comparisons: (1) regular resident class(es) vs TEDS classes(es), (2) regular resident class(es) vs resident TEDS class(es), (3) resident TEDS class(es) vs remote TEDS class(es), (4) on-site class(es) vs TEDS class(es), (5) on-site class(es) vs resident TEDS class(es), and (6) TEDS offerings will be compared when repeated. Total evaluation will be complete in approximately one year.

All data collection instruments were designed by AFIT.

Student Learning (Achievement)

Student learning (achievement) is being measured by comparing content pretest performance and subsequent content examination scores.

Perceived student learning is being ascertained through use of a student end-of-course critique and an appraisal by both the student and his/her supervisor six months after course completion. Presenters are asked to assess their own effectiveness after using the TEDS.

Presenter Appraisals

Student teams in each classroom will rate each presenter. Resident team ratings will be compared to remote team ratings.

System Acceptability (Affective)

Students, their supervisors, presenters, site monitors, and visitors are being asked for their opinions of the TEDS. Students provide their impressions using the TEDS version of the end-of-course critique and the six-month post course student questionnaire. Students' supervisors will be asked to express their opinion of the TEDS schedule and the part-time availability during instruction of their employees. A Site Monitor Daily Critique collects site monitors' impressions of the delivery system. Visitors to any TEDS classroom are asked for their reaction to the system.

System Acceptability (Operational)

System operational performance is documented daily at each site by students and site monitors. A daily system performance log is maintained at the central patch panel.

System Acceptability (Cost)

System cost data include all lease and installation changes. Comparisons are made between system costs and the costs which would have been incurred had the students come to Wright-Patterson AFB for resident instruction.

Findings

As of 1 March 1980, three courses had been provided via the TEDS. One course (Sys 326) was given twice. Complete data analysis has only been accomplished on two courses to date. Results reported here are strictly preliminary and serve principally as guidelines for subsequent system use.

Achievement

Data from the two courses (Log 220 and Sys 326) are somewhat contradictory. The Log 220 resident and remote TEDS students revealed essentially the same academic achievement. Resident TEDS students in the Sys 326 course scored significantly higher than remote TEDS students on measures of learning achievement.

System Acceptance

Student acceptance of the TEDS system varied widely from very high acceptance to almost total rejection. No remote site group accepted the schedule although class meeting times ranged from 9 a.m. - 1 p.m. (PCT) to 12 to 4 p.m. (EST). Commanders of AFSC and AFLC have expressed their enthusiasm for the networks.

Cost

Using only these first two courses offered via TEDS and including installation costs, there was a $48,000 cost avoidance realized. Projected cost avoidance for the remainder of the fiscal year using the current course schedule will approximate another $250,000.

System Operation

There were periodic audio transmission problems involving interference at remote sites due to air traffic control overrides. Some instructors' voice volume varied greatly. The electronic blackboard and the dedicated audio lines presented almost error-free operation.

Discussion

Although there are insufficient data currently available to arrive at definitive conclusions, there are indications that the nature of course content, age/experience of students, and environmental conditions at remote sites play an important role in student achievement and system acceptability. Some tentative conclusions have been made and actions taken.

One course (Sys 326) was reduced from 80 hours to 60 hours after its first offering because students felt there was too much content provided in a short time. One remote site classroom was replaced by a larger one. Local site monitor activities varied and where these monitors remained involved every class hour, the students were more receptive to the delivery system. Instructor microphones were unidirectional which caused volume variation during transmission. Omnidirectional mikes have been ordered. Some remote sites had not received their student microphones which inhibited student interaction. The electronic blackboard was not used to any great extent, yet 77% of the students felt it should remain a system component.

One apparently influencial factor in student negative reaction to the delivery system was the fact that some supervisors expected students, even though attending 4 hours of class per day, to fulfill their 8 hour job responsibilities.

The Future

Action is being taken to remedy the external negative influences upon students, to correct transmission problems, and to improve the remote site classrooms. Some content revisions are being made.

Results of subsequent system use will provide more reliable information concerning the effect upon learning and system acceptance since most initial "unknowns" will have been identified and corrected.

Later studies will provide the definitive data necessary to properly answer the research questions.

Already AFSC is planning to expand the system by adding 11-15 remote sites. The AFLC has used the system on several occasions to conduct workshops, seminars, and short courses. Actual saving of TDY monies has been documented.

Conclusions

The concept of Teleconferencing in the Air Force is gaining acceptance. We look for system expansion, greater system use, and increased diversity of applications.

THE FIRST ELECTRONIC BLACKBOARD TELECOMMUNICATION NETWORK FOR GRADUATE ENGINEERING PROGRAMS

Jimmy W. Seyler
Academic Coordinator
Office of Continuing Education and Public Service
Engineering
University of Illinois at Urbana-Champaign

The University of Illinois at Urbana-Champaign created the first Electronic Blackboard communication network for graduate engineering courses by installing what was then experimental boards developed by Bell Laboratories in the communication network operated by the U. of I. in the State of Illinois. These experimental boards were used from January, 1974, until October, 1977, during which time several modifications were made resulting in a more useful communication device. In October, 1977, these boards became available as a commercial product and available for lease from Illinois Bell in the State of Illinois. In other parts of the United States this equipment could be leased from the local Bell Systems.

The University of Illinois at Urbana-Champaign began its Engineering Continuing Education Communication Network in 1967 using other writing equipment. This communication network consisted of both a writing and a voice circuit so that communication involving both could be used simultaneously. By 1974 this system had expended into two (2) separate networks one used only for engineering courses and the other used for a variety of subjects. Remote Centers had been installed in community colleges, governmental buildings, private industrial buildings and University owned centers in Illinois. During this period we also established a joint network with the University of Wisconsin at Madison so that courses presented in Madison could be taken by students in the State of Illinois and courses presented in Urbana could be taken by students in Wisconsin. We wanted to establish that the only limitation for such a network would be "where a telephone could be installed."

The availability of the Electronic Blackboard has been a great help for presenting the conventional on-campus engineering classes to engineers at various locations throughout the State of Illinois because our teaching staff has no adjustments to make in their class presentation. They are in the habit of using a chalkboard for the presentation of sketches, diagrams, equations, charts, and tables in the presentation of material and during the discussion of engineering principles. With students at remote centers, it is necessary to prepare material a little farther in advance in order to have it mailed to the remote centers, if the material is to be distributed at the class session.

NEW STUDENTS NOW ABLE TO PARTICIPATE

Prior to a communication network that could tie Centers to the campus classroom in such a way that there could be a complete exchange of ideas in both written and verbal form, there were very limited ways of including professional people in graduate programs on our college campuses. They usually had to either take time out from their work and attend classes on the campus or be in a class of large enough size that a member of the faculty could travel to a community and present the graduate course. If there were too few people in and around the community wanting a particular specialized course, then the course was not offered. It became a matter of economics and the availability of teaching faculty members that determined if these graduate courses could be given. It is now possible for professional people to attend graduate centers and participate in graduate courses being offered at the colleges and universities from their own community and exchange ideas with other graduates both on the campus and at other centers. The exchange of ideas between professional people can now also be accomplished without having to travel long distances using valuable time and energy. The added dimension of being able to use instant writing over long distances simultaneous with verbal discussion provides a great advantage in communication and in particular in education.

CONTINUING EDUCATION PROGRAMS FOR ADULTS

The University of Illinois is using this Communication Education Network for the presentation of programs that contribute to the professional development of adults. Before selecting this system for use in its continuing education activities we established some of the essentials for a good program and evaluated this system against these requirements. These requirements are:

1. The program should be one that permits the individual to focus on an area that is of particular significance to him or her at a particular point in time.

2. The program should bring together people who are knowledgeable in the given subject area.

3. The program should allow for an exchange of ideas, and provide an opportinity for each person involved to express ideas, questions, alternative solutions, and practical suggestions.

4. The program should be one that has some immediate or short-term goals.

5. The program should be structured so that a fixed time limit is established in order to require that immediate conclusions must be reached in order that other topics may then be pursued.

6. The program should have a reasonable time frame that will be generally convenient to all participants.

7. The program should not demand unreasonable time commitments of any of those participating. The efficient use of everyone's time should be considered.

8. All appropriate media should be used which contributes effectively to the learning and understanding process.

9. The program should be designed so that it does not require large groups of people from a single location in order to justify it economically. The professional person who is specializing may not always find a large number of others in his or her community who have the same specific interest at the same point in time.

10. The program should be available at a reasonable cost in terms of both dollars and time.

Many of the requirements for good programming can best be served by using the Electronic Blackboard for at least a part of the program presentation.

THE UNIVERSITY OF ILLINOIS ELECTRONIC BLACKBOARD SYSTEM

The Electronic Blackboard System, which has been adopted by the University of Illinois at Urbana-Champaign, consists of classrooms having three (3) electronic blackboards in each of the campus classrooms. The reason for using three boards is to provide the adequate space for the presentation of the engineering ideas and problems in our graduate courses. Each of the Remote Centers have three (3) TV monitors (one for each blackboard). The Remote Centers also have at least one (1) electronic blackboard so that anyone at a remote center can present written information to everyone on the network. All Centers, both on campus and off campus, have a regular audio tape recorder which can be used to record both writing and the audio discussion. These tape recorders are particularly useful for the engineer who may have to miss a particular class because of a business commitment. That engineer can arrange to have the class recorded and come in and review the missed class before the next regularly scheduled class meets. It can also be useful in recording notes that may not be completely recorded during the class. Slides may be used in classes by sending duplicate sets of slides to all the Remote Centers. Material which is distributed to the class is mailed in advance to the Remote Centers.

Instructors usually visit each of the Remote Centers one or several times during each semester and may teach a class session from the Remote Center with the on-campus students using the TV monitors in the classroom and the classroom microphones.

The Engineering Continuing Education Network System operates from 8:00 a.m. until 5:00 p.m. to present regularly scheduled graduate engineering courses offered on the Urbana-Champaign campus to the local campus students and simultaneously to engineers at Remote Centers. These courses carry resident credit for all participating students. From 5:00 p.m. until 10:00 p.m. the network is used for other graduate courses which have extension credit rather than resident credit and for non-credit classes of special professional development nature which do not comply with the graduate course requirements. These classes are available to many individuals who may not desire credit particularly or may not meet the requirements of the Graduate College.

COST OF THE NETWORK OPERATION

The cost of operating a Remote Center will range from $15,000 to $20,000 per year depending on the programming. This can be compared to presenting three (3) or four (4) extramural courses each year in a community remote from the campus. (Extramural Courses cost about $5,000 each to offer in a community at a distance of from 100 to 200 miles from the campus.) These three or four courses would normally serve from 60 to 120 people in the community each year. Using the Communication Network, which can offer as many as sixteen (16) to twenty (20) courses each semester or up to fourty (40) courses per year, it is possible to serve up to ten (10) times the number of people for the same cost. Realistically, the individual course enrollment will be much smaller on the Network but many more course offerings can be made available and if we serve only two (2) or three (3) times as many people for the same cost, that is a significant savings in both time and dollars. The price of equipment and telephone lines will vary so it is necessary to get prices from each local telephone company.

As fuel and energy costs continue to rise and with the demands on everyone's time increasing, it seems essential for us to use the most efficient and effective tools at our disposal for quality education.

TUTORSHIP BY TELECONFERENCING IN DISTANCE EDUCATION: AN EVALUATION REPORT AT TELE-UNIVERSITE

Thérèse Lamy
Louis Villardier
Tele-universite

1. Introduction : A short story

Teleconferences in distance education systems are generally used in two ways. One application currently seen in many american institutions uses telephone to link large groups of students meeting in one room with an instructor in another location, transmitting the contents of the course. Another use, as it is practiced at Tele-universite and Open University (U.K) links a small number ($<$ 10) in their own homes.[1]

Tele-universite, a multi-media teaching system, started to incorporate the telephone network as an educational aid in 1975. The use of the telephone network as a substitute to face-to-face encounters has been made very gradually. At first tutors and counsellors would make a few calls to check the progress of a small numbers of students. But it soon become evident, with the growth of Tele-universite, that if it were to be true to its mandate of reaching the geographically or psychologically isolated student, it would have to make greater use of the telephone system. The use of the telephone as a link appeared a necessity with students scattered throughout a wide territory, with hard and long winters. In fact the telephone has enabled many students to have access to a learning experience otherwise difficult. Therefore in recent years, in nearly all the courses offered, there were students linked by telephone. Despite the widespread use of the telephone system, they were mixed feelings amongst the academic staff on the quality of this service. In order to clear up the situation, the bureau of Educational Technology was asked to make an evaluation study. The objectives of this evaluation were: to find out if teleconferencing hinders enhance learning in a distance study system. Does teleconferencing allow to reach in an adequate way the geographically and psychologically isolated learner? This paper sums up the results of this evaluation study.

2. Methodology

This study was conducted in September 1979. We selected at random a list of 500 students registered in different courses for over a period of at least two academic years. A questionnaire was mailed to these students. They had fifteen days to answer this questionnaire. A second letter was sent for the latecomers. After a month, the collect of questionnaires was ended. We had received in that period two hundred and fifteen (215) questionnaires. Considering the fact that a hundred letters had been returned with a wrong address, we consider this to be a valid response.

They were two categories of students amongst those who answered the questionnaire. The first category was called (conference) or group conference, links a small group of students $<$ 10 in their own home with a tutor, we will refer to them from now on, as group A. The second category, called (aide individuelle) individual conference, links one student in his own home, will be referred to as group B.

This paper will delineate information on four aspects of teleconferencing at Tele-universite.

1) Status of students.
2) Student feelings on teleconferencing in general and types of services provided.
3) Tutorship and teleconferencing, how it works.
4) Tutorship by teleconferencing, a comparison with other forms of tutorship.

3. Status of students

Who are the students using the facilities of the telephone network for learning? What is their age, their occupation, academic qualifications?

Figure 1 : Age

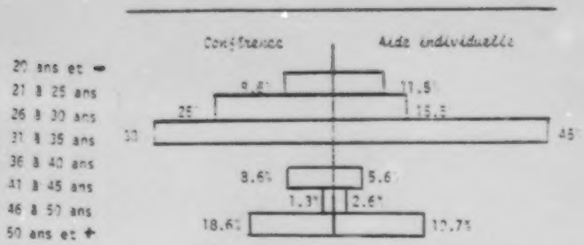
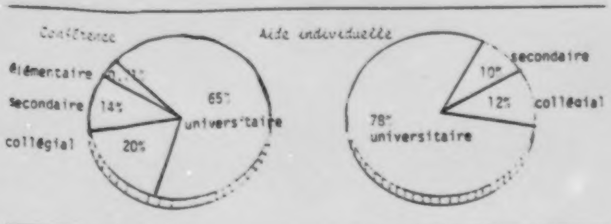
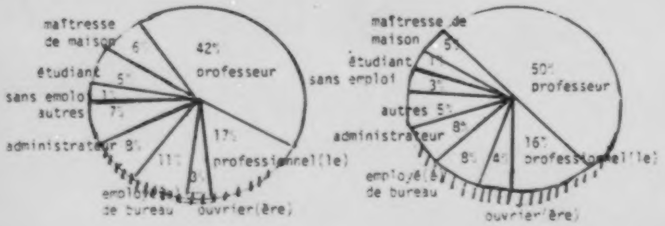


Figure 2 : Niveau d'études



Nombre de répondants 142 74

Figure 3 : Occupation



Nombre de répondants 142 76

These characteristics of teleconferencing students demonstrated in Figures 1, 2, 3 are quite similar to those of the "regular" population of the student body. However, there are more students in the group age of 50 and over, in the telephone group than in the "regular" group which stands at 11.4%.[2]

We may also notice the very high number in figure 2, of university degrees amongst our students. This is also common to all our clientele and seems to be also a problem in many continuing education systems throughout the world. We haven't yet found any satisfactory explanation for this situation and despite a lot of soul searching and hard fact analysis this trend is continuing. Figure 3, shows a large proportion of teachers at the primary and secondary level, this also is a typical tele-universite clientele. However significant breaktroughs have been made in recent years, for instance with office employees. It is not, however, the purpose of this paper to delve in further into these matters. The important point we should stress here is that our teleconferencing students are very typical of the majority of the students at Tele-universite.

4. Students feelings about teleconferencing in general

As many of us involved in distance education may know, the quality of information given to students about how a system works is very important in the motivation of our clientele.

First it must be said that 77% of group A and 73% of group B had already been involved in teleconferencing before. Both groups of students are very highly satisfied with the services provided by Tele-universite, concerning information received on teleconferencing tutorship. More than 2/3 of both groups declare to have receive sufficient information and have found the teleconferencing guide very useful. More significant is the answer of students regarding the objectives of teleconferencing.

The question may be translated as follows : The objective of tutorship by teleconferencing is to permit students either psychologically or geographically isolated to receive adequate assistance from a tutor on all subjects pertaining to his learning.

Do you think that the teleconferencing you have experienced, has reached this objective?

Figure 4 : L'objectif

	Répondants	Distribution en %					Moyenne
		Oui, tout à fait			Non, pas du tout		
		1	2	3	4	5	
Conférence	138	48	25	19	7	1	
Aide individuelle	73	38	37	19	6	--	

5. Tutorship and teleconferencing : how it works

This is the core of our evaluation study, which will permit us to gather some insights on different aspects of tutorship by teleconferencing as perceived by students.

5.1 Attitude of students. Group A reports a high level of awareness to the other members of the group as figures 5 and 6 show.

Figure 5 : L'appartenance

Nombre de répondants : 137

	très nettement				pas du tout	
	1	2	3	4	5	
Avez-vous eu l'impression d'appartenir à un groupe même au bout du fil?	28 20%	30 22%	35 25%	20 15%	25 18%	2.98

Nombre de répondants : 138

Figure 6 : Identification de l'interlocuteur

	oui, toujours				non, jamais	
	1	2	3	4	5	
A tout moment saviez-vous qui parlait?	32 23%	35 26%	37 27%	28 20%	6 4%	2.5

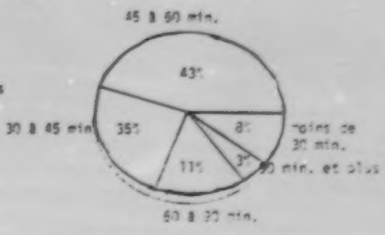
Nombre de répondants : 137

In group A, 80% of the students report they had no difficulty adjusting to this type of tutorship. Group B felt the same way, since 83% of the students declare to have had no problem in adjusting. In group A, only, 9.3% of the students declare that they cannot learn with the telephone.

5.2 Frequency and length of teleconferences. Both groups have been exposed to a least 3 teleconferences during their three (3) credit course . Looking at figures 7 and 8, group A thought that the ideal length for a teleconference would be a half-hour.

Figure 7 : Durée

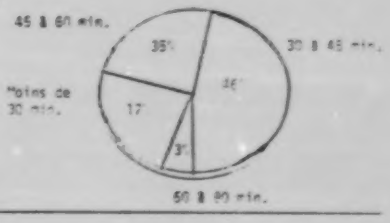
Précisez la durée moyenne des conférences auxquelles vous avez assisté?



Nombre de répondants : 132

Figure 8 : Durée idéale

A votre avis, quelle devrait être leur durée moyenne?

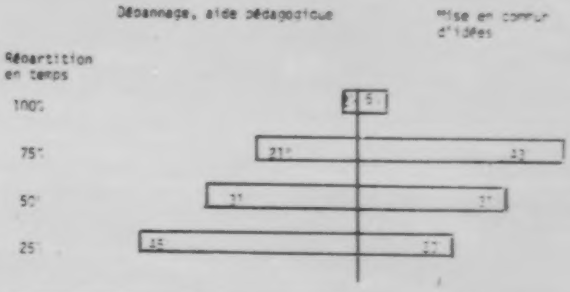


Nombre de répondants : 123

Group B had the same opinion on these questions.

5.3 Contents of the teleconference. In group A, 66% of the content of the teleconferences was about the subject matter of the course, 24% on the learning sequences and 10% on some of the learning activities proposed in the course. Results of figure 9, demonstrate very clearly, the particular nature of teleconferencing at Tele-universite.

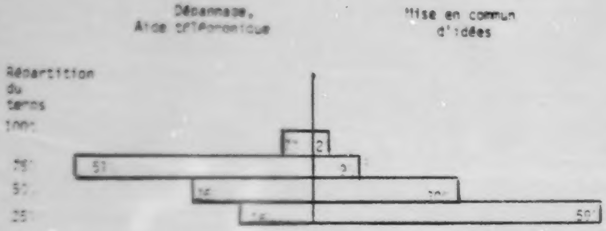
Figure 9 : Nature des discussions



Nombre de répondants : 114

Time is quite evenly spread out between the sharing of ideas (mise en commun) and aid to learning (dépannage). However, looking at group B, Figure 10, we may notice that le (dépannage) takes a much large share of the time than in group A.

Figure 10 : Nature des discussions



Nombre de répondants : 73

This is of course can be easily explained by the fact that the students do not have the advantage of group sharing.

5.4 Technicals problems. The technical problems reported by both groups are insignificant. The major nuisance for group A, having been a certain difficulty in establishing the communication.

5.5 Value of teleconferencing. For a great majority 60% group A, 85% group B, tutorship by teleconferencing became more interesting as the course progressed. These students thought that teleconferencing was very enriching and profitable to their learning experience.

The minority who's interest warned in group A explained that it was because they did not like working with a group whether on telephone or face to face. In consequence, 53% of them say they became very passive during discussions.

The students' high rating of tutorship by teleconferencing is strongly expressed in figures 11-12. The overall value of teleconferences is eloquently expressed in figure 11.

Figure 11 : Appréciation générale

Aspects	Distribution en %							Moyenne
		1	2	3	4	5		
Atmosphère	détendue	34	28	27	7	4	tendue	2.2
Encadrement	structuré	28	44	19	7	1	non structuré	2.1
Animation	dynamique	32	43	18	5	2	plate	2.2
Echanges	fructueux	24	36	19	16	5	infructueux	2.4
Discussions	riches	17	34	35	9	5	pauvres	2.5
Groupe	stimulant	15	24	26	20	15	non stimulant	3.0
Animateur	stimulant	41	41	14	4	--	non stimulant	1.8

Nombre de répondants de 133 à 136 selon les divers aspects.

The students in group A feel very strongly that tutorship by teleconferencing has helped them to reach the course objectives and their personal objective. They think that this type of tutorship has enhanced their learning activities (figure 12).

Figure 12 : L'intérêt des téléconférences

Items	Tout à fait en accord 1	Plutôt en accord 2	Plus ou moins en accord 3	Plutôt en désaccord 4	Totalement en désaccord 5	Moyenne
. Je considère que ces conférences téléphoniques m'ont permis d'être mieux outillé pour faire mes activités à domicile.						2.3
. Les interventions du groupe m'ont permis de faire des liens avec mes propres interrogations.						2.4
. Je considère que dans leur ensemble les discussions de groupe auxquelles j'ai participé, m'ont été profitables tant sur le plan des échanges personnels que sur celui de l'apprentissage.						2.5
Je considère que cette forme d'encadrement m'a aidé :						
. dans l'atteinte de mes objectifs personnels						2.4
. dans l'atteinte des objectifs du cours.						2.3

Nombre de répondants : de 131 à 139 selon les divers items.

5.6 The tutor. Students in both groups are very satisfied with the services of their tutor, all rate very highly the competence and the quality of his work. The student particularly appreciate the fact the tutor helped maintain the interactive quality of the communications. In fact the responsability of initiating the teleconferences was shared in equal proportion, by the tutor and the students in both groups. Group A shared equal responsability in the determining the agenda with the tutor, and group B decided the agenda in even greater proportion 89%.

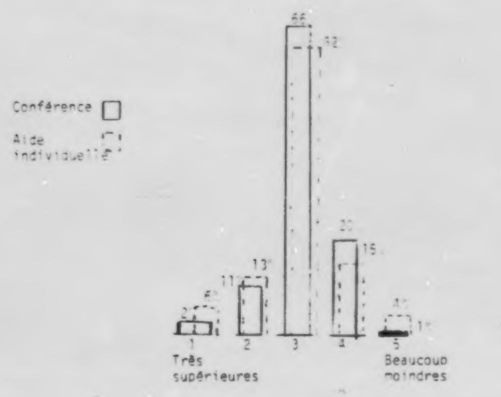
6. Tutorship by teleconferencing : A comparison with other forms of tutorship

In this section of the questionnaire we asked (150) students who had had experience with other forms of tutorship to compare those with teleconferencing.

6.1 Difficulty and workload. Sixty-one (61%) of group A considered that they have more difficulty in their learning experience with teleconferencing. Fifty-two (52%) of group B expressed the same feeling. The explanation for this feeling seems to be that this mode of tutorship by teleconferencing requires greater efforts than other types of tutorship currently used at tele-universite. At least, this is the opinion of 48% of group A and 50% of group B.

6.2 Quality of the learning experience. Despite there difficulties both categories of students think that they have learned as much as with other forms of tutorship (figure 13).

Figure 13 : Les acquis



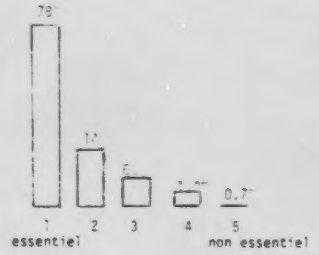
Nombre de répondants Conférence : 74 Moyenne : 3.1
Aide individuelle : 54 3.3

Certainly one of the reason for this positive answer must be ascribed to the quality of the design and self sufficiency of the printed texts sent to the students. Both groups of students affirm in fact that the printed texts alone could permit autonomous learning. Group A - 61% and group B - 76%.

6.3 The future of teleconferencing. This section of the questionnaire is particularly important, since one of the objectives of this evaluation study was to find out if students were satisfied with tutorship by teleconferencing. Sixty-eight (68%) of the students thinks that this type of tutorship is very appropriate for isolated students. In group A, 64% would be ready to register for an other course, using the same type of tutorship. In the event that a course would be offered with only this mode of tutorship, (52%) of group A and 66% of group B would not consider registering for another course with a different type of tutorship.

However in these circumstances, the students would prefer, with a very slight margin, individual teleconferencing (50%) to group teleconferencing (49%). Students of both groups say that they prefer tutorship by teleconferencing if they have drive more than one hour to attend a meeting. Finally, they consider essential that Tele-universite maintain this service (figure 14).

Figure 14 : Service essentiel



Nombre de répondants : 138 Moyenne : 1.2

7. Conclusion

Tele-universite, there is no doubt in the minds of the students, should maintain tutorship by teleconferencing.

For the students, the answer to both questions, we pointed out in our introduction, is clearly positive. Tutorship by teleconferencing enhances learning and it is an excellent way of reaching those who are isolated and who otherwise could not have enjoyed a learning experience.

This mode of tutorship could be improved, but it is not the purpose of this paper to delve into this question. However one experience, with the cours L'informatique, c'est pas sorcier points to one way of bettering this educational aid. This basic computer course shows us how we could enhance tutorship teleconferencing by using the computer and eventually television. In L'informatique, c'est pas sorcier, the computer has became a communication system for the students who use it to solve problems between themselves, as a mail box for all sorts of messages. All these exchanges are considered very important to create cohesion between students in a distance study situation.

In conclusion we feel, that telephone linked with other systems, will become an essential part of every student's course enabling to reach more isolated students, making l'universite a domicile an tangible reality.

1. Daniel, J.S. Telephone in education.

2. Grenier, F., and Marquis. The Teleuniversite of Quebec (1972-1979/The Open University Conference on the Education of Adults at a distance, Birmingham, November 79).

APPALACHIAN COMMUNITY SERVICE NETWORK
INTERACTIVE DISTANCE EDUCATION

Nofflet D. Williams, Director
Program Operations Center
University of Kentucky
Lexington, Kentucky

INTRODUCTION

Once upon a time interactive distance education referred to forms of teleconferencing which brought providers of information in contact with learners grouped together in two or more locations in a small geographic area. The size of the geographic area covered increased and the quality of technology improved until teleconferencing networks used audio, slow scan video, electronic blackboards, audio/video, and two-way video interactive formats.

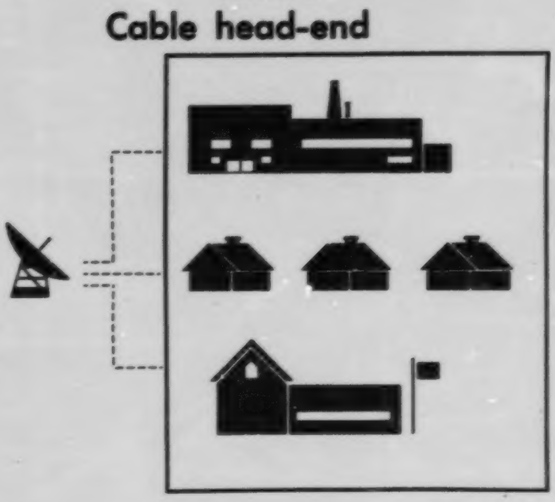
The decade of the seventies provided the framework for an information and communication revolution that may have great potential for interactive distance education in the eighties. The term "may" is used advisedly because the level of impact will be directly related to the willingness of instructional personnel and administrators from institutions of higher education to join forces to make educational opportunities available to citizens in their homes.

SATELLITE AND CABLE TECHNOLOGY

In 1973, Professor Michael Dann of Yale University taught a course titled "The Wired Society" in which he discussed electronic access to homes. He recently stated that "The revolution has already started, and it is running at least five years ahead of my predictions. By 1985, half of the American homes, some 35 million, will be wired...." He predicted that citizens will be "taking academic courses at home from first grade through graduate school...."[1]

The increased potential for learning in the home, including interaction between providers of information and learners, via one-way video and two-way audio when appropriate, is directly related to the development and growth of satellite and cable technology. Recent breakthroughs in the development of home recording units utilizing timing devices will also accelerate the off-air recording and use of academic courses by citizens in their homes. Figure 1 illustrates the unique access capability provided by satellite reception at the head end of cable systems. More than 2,000 communities already have the ability to receive signals via RCA SATCOM I. Cable systems with fewer than 1,000 subscribers are finding it economically feasible to utilize satellite programming.

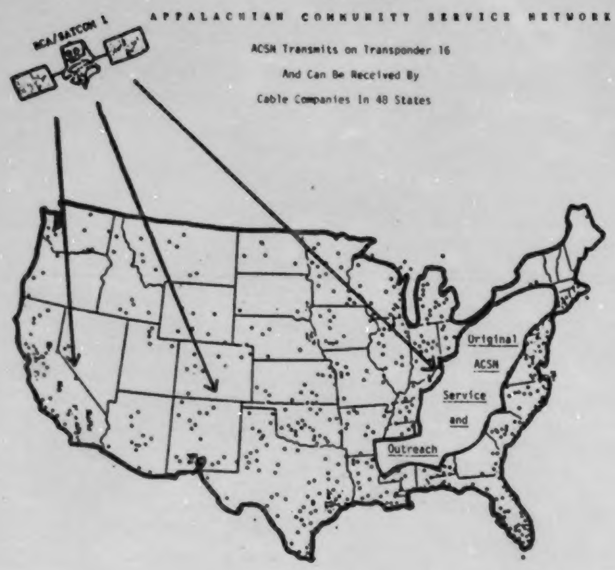
FIGURE 1



This paper will focus on the evolution of the Appalachian Community Service Network (ACSN) from an experimental regional network to an embryonic national network with a 60 hour broadcast schedule projected by September 1, 1980. This expansion will occur while maintaining ACSN's commitment to the Appalachian region. A secondary delivery model will be described which promotes videotaping and the delayed use of programming in communities that do not have cable systems. Figure 2 indicates the potential geographic coverage of ACSN via

RCA SATCOM I.

FIGURE 2


APPALACHIAN COMMUNITY SERVICE NETWORK
RCA/SATCOM I
ACSN Transmits on Transponder 16
And Can Be Received By
Cable Companies In 48 States
Original
ACSN
Service
and
Outreach

WHAT IS ACSN?

The Appalachian Community Service Network (ACSN), known in its experimental phase as the Appalachian Education Satellite Program (AESP), is a community-based telecommunications network which provides a wide range of public service and post-secondary education programs. ACSN is managed by the Education Division of the Appalachian Regional Commission (ARC), Washington, D.C. A public non-profit corporation is being formed and will be incorporated in the District of Columbia. It will provide a framework for cooperative action and resource sharing nationwide.

In addition to the Central Staff located in Washington, D.C., the Program Operations Center and Engineering Center are located at the University of Kentucky, Lexington, Kentucky. Program development occurs at Resource Centers and receiving sites are operated by institutions of higher education, educational cooperatives, and hospitals.

ACSN PROGRAMMING

As a public service network, ACSN provides a mix of instructional and information programming. By developing a network that serves a large geographic area, ACSN can provide educational activities for specialized professional and paraprofessional groups, parents, senior citizens, and volunteer groups. A variety of instructional formats are available through ACSN and an interactive element is included in courses, workshops and teleconferences to assist in serving the distant learner.

Telecourses

Graduate, undergraduate and continuing education courses are offered for credit and non-credit. Included in the credit offerings are programs for personnel in medical and health services, human resources, business and industry, government and education. Outreach, coordination and credit are available through cooperating local institutions of higher education. ACSN is not a degree granting or a credit awarding agency.

The instructional design of telecourses involves a mix of taped and live interactive television broadcasts and a print component including a textbook, study guide and administrators manual. The study guide includes individual, group and field-based assignments thereby accommodating both home-based and classroom instruction. Live seminars provide a means of interacting with the instructor and an opportunity to question visiting experts, practitioners and textbook author(s).

Persons participating in the telecourses at home meet at a central location, usually a regional institution, three to five times during the semester for required activities and testing. Students meeting at a community site view an hour long televised program and take part in two hours of on-site learning activities during each class session.

Workshops

Workshops are designed to provide timely information or training for specific groups such as registered nurses, social workers, educators, physicians, volunteer firemen and parents. Workshops include a mix of taped and live interactive broadcasts and selected written materials. The broadcasts are usually limited to 1½-2 hours with on-site or in-home activities scheduled prior to and/or after the broadcasts.

Workshop content is planned with experts at the university, federal, state and local levels. The experts are presented on videotape or in person to answer questions generated at the local level. A toll-free call-in system allows participants to question the experts. Some questions are written down at phone banks and presented by the panel moderator, while other questions are passed directly into the studio via a telephone patch. The call-in system is also utilized to allow panelists to participate in the interactive part of the workshop from locations throughout the United States. Videotape inserts and demonstrations are also used to change the pace of the workshop and make them more visually interesting.

Teleconferences

The term teleconference is used to distinguish between workshops that originate from the studio in Lexington, Kentucky on a routine basis and programs that originate from national conference locations throughout the United States. For example, teleconferences have been developed in cooperation with the National Association of Social Workers and the American Nurses' Association. A teleconference on the "Videodisc and Education" originated from the Association for Educational Communications and Technology Convention in Denver, Colorado on April 23, 1980. A number of other teleconferences are being planned for the next 12 months to take advantage of the presence of selected experts at other conventions.

Community Service

Community service programming provides timely information on topics of interest to consumers. Some of the areas explored include energy, inflation, aging, business, parenting, job promotion, recreation, health, travel, art and music.

PROGRAM IDENTIFICATION

ACSN program selection is based on needs assessment information secured from client groups, local advisory groups, site monitors, cable operators, community leaders, and national and state professional associations. ACSN has an extensive review process for locating quality courses and video materials to use in workshops, teleconferences and community service programming. The areas of program interest identified through recent surveys and needs assessment activities are summarized in Table I.

SOURCES OF PROGRAMMING

The Appalachian Community Service Network produces programming and utilizes the programming of other producers and distributors. Some examples of organizations, agencies, and institutions with whom ACSN has or is currently working are listed below.

Agency for Instructional Television
AIMS Instructional Media, Inc.
American Red Cross
Association for Media-Based Continuing Education for Engineers
Bureau of Education for the Handicapped
Cambridge Book Company
CHAUTAUQUA BOCES
Coast Community College District
Coe Film Associates
Colorado State University
Cornell University
Dallas Community College District
Film Communicators
Films, Inc.
Great Plains National Instructional Television Library
Handel Film Productions
Martha Stuart Communications, Inc.
Maryland Center for Public Broadcasting
McGraw Hill Films
Media Five
Medical University of South Carolina
Modern Talking Picture Service
National Aeronautics and Space Administration
National Institute of Education
National Science Foundation
Ohio University
Professional Development, Inc.
Small Business Administration
Smithsonian Institution
University of Kentucky
University of Mid-America
University of Mississippi
University of Wisconsin
U.S. Department of Energy
Wayne State University
West Virginia University

COURSE/WORKSHOP PARTICIPATION

Persons representing the wide diversity of American life participate in ACSN courses and workshops. For example, specialists from colleges and universities, Federal, State, and local agencies, and professional associations are

TABLE I
ACSN Areas of Program Interest

Site Monitors' Requests

Courses

1. Managing a Small Business
2. Designing Home Interiors
3. Aging
4. Marketing
5. The Growing Years
6. Personal Finance and Money Management
7. Solar Energy
8. Child Abuse
9. Writing for a Reason
10. As Man Behaves
11. Physical Fitness
12. Quantitative Methods for Business
13. Management Practices
14. Feminist Theory and Implications for Social Change

Government

1. Firefighters
2. Police

Medicine

1. Nurses
2. EMTs
3. Nurses' Aides
4. Physicians' Assistants

Education

1. Elementary Teachers
2. Pre-School Teachers
3. Secondary Teacher
4. Special Ed. Teachers
5. School Social Workers

Human Resources

1. Senior Citizen Center Workers
2. Child Care Workers
3. Paraprofessionals
4. Corrections Personnel
5. Social Workers
6. Rehabilitation Counselors

Business-Industry

1. Business owners & managers
2. Secretaries
3. Beauticians

Overall Rank Order

1. Firefighters
2. Nurses
3. Police
4. Elementary Teachers
5. Senior Citizen Center Workers
6. Child Care Workers
7. Preschool Teachers
8. Emergency Medical Personnel (EMTs)
9. Business Owners and Managers
10. Secondary Teachers
11. Nurse Aides
12. Human Resource Paraprofessionals
13. Corrections Personnel
14. Special Ed. Teachers
15. Social Workers
16. Rehabilitative Counselors
17. Secretaries
18. Beauticians
19. School Social Workers
20. Physician's Assistants

Community Interest Survey (cable & community leaders)

Changing Family

1. Child Abuse
2. Vandalism and Violence
3. Motivating Children
4. School/Community Relations
5. Counseling the Adolescent
6. One Parent Families
7. Spouse Abuse
8. How Children Learn
9. Death and Dying
10. Living Alone

Government

1. Crime Prevention
2. Use of Tax Money
3. Community Problems
4. Citizen Participation
5. Fire Prevention
6. Police/Community Relations
7. Community Improvement
8. Tax Assessment
9. Public Transportation

Arts

1. Music
2. Drama
3. Painting
4. Dance
5. Literature

Children

1. Programs for Preschoolers
2. Programs for Elementary Students
3. Programs for Secondary Students

Aging

1. Retirement Planning
2. Use of Leisure Time
3. Housing
4. Health
5. Physical Fitness
6. Nutrition
7. Psychology of Aging
8. Drugs

Consumer

1. Auto Repair
2. Energy Conservation
3. Gardening
4. How to Buy and Sell a House
5. Legal Problems
6. Budget Technique
7. How to Get, Find, and Keep a Job
8. Property Rights
9. Writing a Will
10. Careers

Business

1. Money Management
2. Investments
3. Income Tax Preparation
4. Management Techniques
5. Communications
6. Time Management
7. Record Keeping

Cultural-Ethnic

1. Cultural Topics
2. Folklore
3. Sign Language

Science

1. Energy
2. Environmental Issues
3. Pollution
4. Metrics
5. Astronomy
6. Geology

History-Human Interest

1. American History
2. Recreational Activities
3. Leisure Time Activities
4. Old Movies
5. Travelogues
6. Nature Films

Types of Services Desired

1. Continuing Education Activities
2. Undergraduate Courses
3. Workshops
4. Use of "800" Toll Free Number
5. General Interest Programs
6. Graduate Courses

Life & Health

1. Exercise
2. Alcoholism
3. First Aid
4. Heart Disease
5. Coping with Stress
6. Handling Emergencies
7. Meeting the Needs of the Older Person
8. Cancer
9. Simple Home Health Techniques
10. Drug Education
11. Smoking
12. Mental Health

utilized on a regular basis. The list below illustrates the scope of this cooperation. Each of the following colleges and universities provided one or more specialists for a course and/or a workshop in which one-way video and two-way audio interaction occurred.

Allegheny County Community College
Appalachian State University
Arkansas State University
Athens College
Auburn University
Baylor Medical University
Case Western Reserve University
Colorado State University
Converse College
Cornell University
Duke University
East Tennessee State University
Eastern Kentucky University
Emory University
Frostburg State College
Georgia Institute of Technology
Indiana University
Keene State College
Kent State University
Moorhead State University (Minnesota)
Morehead State University (Kentucky)
New York University
Ohio University
Ohio State University
Oklahoma State University
Pennsylvania State University
Temple University
Tennessee Technological University
University of Akron
University of Alabama
University of Arizona
University of Connecticut
University of Cincinnati
University of Illinois
University of Kentucky
University of Los Angeles
University of Maryland
University of Mississippi
University of Missouri
University of New York at Albany
University of North Carolina
University of Pittsburgh
University of Rochester
University of South Carolina
University of Southern Mississippi
University of Tennessee
University of Utah
University of Virginia
University of Wisconsin
University of Wyoming
Utah State University
Virginia Commonwealth University
Virginia Medical School
Virginia Polytechnic Institute and
  State University
Wayne State University
West Virginia College of Graduate Studies
West Virginia University
Western Carolina University

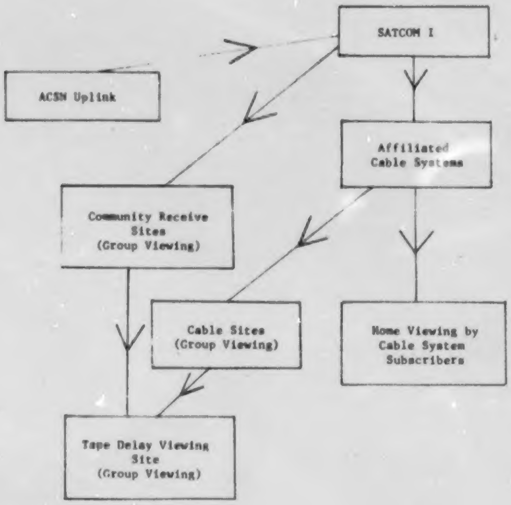
ACSN DISSEMINATION SYSTEM

The ACSN dissemination system utilizes the University of Kentucky Television Studio, Lexington, Kentucky, the ACSN uplink facility located on Coldstream Farm, Fayette County, Kentucky, Transponder 16 on RCA SATCOM I and a hybrid system of receiving sites operated by local institutions and agencies. This hybrid system includes cable delivery to homes, schools, hospitals, businesses and cooperating institutions. Local instructional personnel coordinate outreach in support of the programming. Selected programs are recorded for tape delay use with groups in the community and/or surrounding communities.

Community receive sites, housed in local buildings, receive the satellite transmission via a small antenna. Viewing areas are equipped, operated and administered by the cooperating institution. Students enroll in courses, workshops and teleconferences and may receive credit from cooperating institutions 50-75 miles from the community site. Cooperating institutions also record programs for tape delay use in surrounding communities. Figure 3 shows the dissemination pattern for ACSN programming.

FIGURE 3

Diagram of the ACSN Dissemination System


SATCOM I
ACSN Uplink
Affiliated Cable Systems
Community Receive Sites (Group Viewing)
Cable Sites (Group Viewing)
Home Viewing by Cable System Subscribers
Tape Delay Viewing Site (Group Viewing)

The most important link in the dissemination system is the operation of the local site. Personnel at the local site assume the responsibility for recruiting and enrolling students, distribution of educational materials, monitoring student progress and activities, keeping records, proctoring tests and in general facilitating learning activities. The Central Staff and Program Operations Center personnel are organized to provide support services to the local site personnel.

FUTURE DIRECTIONS FOR ACSN

In addition to the potential for expansion into additional communities in the continental United States in cooperation with local institutions of higher education, privately owned satellite antennas will soon be available at affordable prices. Bob Cooper, Editor in Chief, Satellite Television Technology, traced the development of privately owned TV satellite terminals from a price of $125,000 to the current price of $4,000 for the components required to receive 60 channels relayed from space. He stated that if "you say $4,000 is still too rich for your pocketbook? Stick around--you've come to the right place to learn how to do it for less money."[2] By 1985, many of the unwired homes in the United States may have their own satellite receiving systems.

FOOTNOTES

1. Michael Dann, "The Way Television Will Be," Watch Magazine, December, 1979, pp. 24-28.

2. Bob Cooper, "Editorial," Satellite Television Technology, 1979.

TELECONFERENCING: A NEW CHALLENGE FOR CONTINUING EDUCATION PROVIDERS

Deborah A. Hagman, B.A., M.A.
Coordinator
Washington Education Teleconference Network
University of Washington

Vicki M. Brown-Skeers, R.N.C., M.N.
Health Education Resource Coordinator
Continuing Nursing Education
University of Washington

Teleconferencing at the University of Washington

The WETNET System

The purpose of establishing the Washington Educational Teleconference Network (WETNET) was to provide an economical medium through which the State's four year college and universities (a total of six) could share their resources with one another and the citizens in the State. Therefore, in the design of the system it was determined that WETNET would be housed within The Office of Continuing Education at the University of Washington; the other five institutions would be invited to make a financial commitment to the operation of The Network in exchange for a specified amount of program time and a role in setting policy. Four of the five institutions elected to participate in this fashion for the 1979-80 fiscal year. The University of Washington's Office of Continuing Education funded the major portion of the start-up costs and provided the leadership and support for getting The Network running. The future of WETNET includes the goal that it become a self-sustaining delivery system through fees charged to users.

The WETNET system leases a four wire dedicated telephone line from Pacific Northwest Bell. Almost all of the eleven locations on the line are at institutions of higher education. The equipment used is the model 604 Darome convener, and it is owned by WETNET. One of the special features of the WETNET system is a bridge which allows two additional locations to participate in programs by dialing into the system from a regular two-wire hookup. This feature is utilized to add participant groups as well as to bring in "guest" speakers. While programming is possible during all 24 hours of the day, WETNET generally operates between the hours of 2:00 and 10:00 p.m., Monday through Friday. The capacity of the system is for one program at a time.

During Autumn Quarter 1979-80, which was WETNET's first quarter of operation, personnel (local program administrators or LPA's) at the sites were handled in two different ways. At about half the sites, LPA's were staff members at the institutions and WETNET contracted for their services as required. At the remaining sites, specific individuals were hired on an hourly basis to be LPA's. In both cases, stated responsibilities for WETNET programs included such functions as: opening and arranging classrooms, receiving and distributing program materials, managing audio visual aids, orienting program participants to the system, taking attendance, handling walk-in registrations, and reporting technical difficulties.

The results of the two different ways of employing LPA's were easily defined. In all cases where a specific individual was hired as an LPA, the service provided was dependable and well-managed. Where services had been contracted for, only half the sites provided reliable classroom service. Common failings among LPA's at those sites were misplaced program materials, inadequate attention to responsibilities such as taking attendance, handling on-site registration and so on.

At the University of Washington, The Network was seen primarily as a vehicle for use by professional schools having statewide and/or regional training responsibilities. In the State of Washington, there are currently a number of professions requiring continuing education (CE) for relicensure or for maintaining certification. Among them are certified public accountants, lawyers, psychologists, pharmacists, nurses, and physicians. Other professions, as well, are predicting and anticipating mandatory continuing education requirements. Within education institutions the issues and questions that subsequently arise for the professional schools then become: how do we provide the necessary programs? where must the programs be held in order to attract maximum number of participants? how much will it cost in terms of dollars? in terms of hours and minutes? of additional load on faculty?

For the academic and professional schools, there is another motivation and demand for offering continuing education programs. While they are viewed as an opportunity to provide service, they also have the possibility of becoming big business. The inherent pressure is that of delivering enough programs in a sufficient number of locations to meet the demands of the professionals to be served. Interactive telecommunications provide the vehicle for accomplishing this but one of the unsettled issues for many who utilize teleconference networks is how to organize and present information so that participants as well as instructors are satisfied with the results. Continuing education coordinators and faculty members at the University of Washington School of Nursing were faced with this issue and others as they planned and implemented their first teleconference experience.

The School of Nursing

In the State of Washington, mandatory continuing nursing education (CNE) for relicensure became a reality in April 1979. However, the state's population distribution and geographical characteristics pose some particular problems for CNE delivery. Figures from 1977 indicate the population as 3,661,975. Although one-third of the population lives in King County (Seattle area), a surprisingly large percentage (44%) lives in small, unincorporated areas. This population distribution is reflected in the ratio of number of registered nurses to population per county, which varies from 1:68 in Ferry County to 1:105 in King County to 1:321 in Skamania County.[6] (This information was from the Washington State Board of Nursing and did not indicate number of nurses employed in each county.) The climate and geography of Washington is also marked by variations. The Olympic and Cascade mountain ranges hinder winter travel because of snow and ice. The Olympic Penninsula is covered by rain forests, and travel to and from it necessitates a ferry trip or a long drive. The area west of the Cascade mountain range receives almost constant rainfall, which occasionally precipitates flooding; eastern Washington is arid and desert-like in the summer, snow-covered in winter. All of these conditions make travel to and from urban and rural areas equally inconvenient and expensive for CNE participants and faculty alike.

Currently, most providers of CNE are affiliated with universities, hospitals, state nurses' associations, or schools of nursing. The University of Washington School of Nursing is a major provider of CNE and approved as such by the American Nurses Association (ANA). As a leading school of nursing in the State, it anticipated the advent of mandatory CNE and, in 1978, developed a grant proposal to increase availability of CNE programming in rural or isolated areas by utilizing teleconferencing. As part of this grant proposal, letters of support were elicited from potential sites which included other CNE providers in the State. (Non-ANA approved CNE providers may obtain approval for their offerings by undergoing a review process with the Washington State Nurses Association (WSNA).)

In Summer 1979, although the grant proposal had not yet received approval, the WETNET system was operational, and the CNE office decided to initiate a four week "Nursing Topics" series for Autumn Quarter. One of the first difficulties encountered was eliciting nursing faculty for the program. In June and July the CNE office publicized the WETNET system within the School of Nursing via meetings, individual letters to each of the 150 nursing faculty, and personal contacts with key faculty members. Not one faculty member responded. The main reasons faculty gave for their reluctance to participate were previous commitments, along with lack of time to devote to a medium with which they were unfamiliar. Finally, the Associate Dean for CNE personally contacted four potential speakers and each one of them agreed to adapt already completed lectures to the teleconference system. Payment of an honorarium did not seem to be a significant factor influencing their participation. All of the four faculty expressed anxiety over lack of face-to-face contact with participants and over the awkwardness of utilizing the equipment. Several meetings were scheduled with the WETNET coordinator to familiarize faculty with the system, methods of personalizing their presentations, and pamphlets and appropriate reading materials.

Another major obstacle to be overcome related to the relationship between the CNE office and the other CNE providers. In August a letter was sent to the eleven WETNET sites describing the upcoming teleconference series which was scheduled to begin in November. Surprisingly, the theoretical support which had been demonstrated for the grant proposal disappeared rapidly at two community college sites after the letter was received. One site which had originally written, "there is a need for a variety of program offerings so that nurses will have the option to make a selection. We will welcome the opportunity to cooperate with you . . ." now elected not to participate at all. Another site responded with a letter expressing "misunderstanding and bewilderment" about (1) the choice of topics and (2) the lack of cooperative planning." The chief concern seemed to be that the University of Washington program might have a negative effect on their registrations for previously planned local programs.

In November the "Teleconferencing: Nursing Topics" program was launched at ten sites across the State. Two-hour lectures were presented on four different topics: Alcohol and the Cardiovascular System; Neurological Assessment;

Initial Assessment of the Trauma Patient; and Central Concepts Related to Wellness. The program was advertised via individual brochure mailings utilizing the CNE mailing list. The registration fee was $10 for each session. Pre - registration was encouraged but not required. Course participants totaled 141 for the entire series, which was less than anticipated. Despite the disappointing registration, however, overall response to the program was positive. Registrants were asked to answer a questionnaire and rate each lecture on clarity of course goals, instruction and program organization, adequacy of visual aids and handouts, room size, operation of equipment, and on their willingness to take another WETNET course. Comments about the programs varied with each speaker but were overwhelmingly enthusiastic: "excellent, good, interesting, very informative." One participant who attended two of the lectures wrote requesting more programs and information. She further commented, "I know the attendance has not been great but with greater advertising and promotion that could change." Indeed, since this was a new CNE experience for providers and participants alike, nurses were not yet accustomed to looking to this medium for programs. Another participant wrote, "I originally decided to go and not pay as I would just audit the classes, but after attending and realizing the potential for us 'rural nurses,' I decided to ante up and support the Teleconference financially." (Auditing the programs was not an option, but could easily have occurred because of difficulties in collecting registration fees at the door.) Many phone calls came in, supporting the system. All but two of the participants stated that they would consider taking another teleconference program. These two felt it was not for them because it was too impersonal. So, although the initiation of the system precipitated some feelings of competition from other CNE providers, the participants were enthusiastic and eagerly anticipating future programs.

Development of a Survey Instrument

The positive and negative experiences in the CNE office at the University of Washington prompted the development of a survey instrument to compare and contrast these experiences with other CNE providers utilizing teleconferencing in the United States. Although the focus of the survey was on CE for professional nurses, it was felt that the results would be representative of, and relevant for, CE providers in general. Competition for a market, the struggle to meet mandatory CE requirements, difficulties in providing programs for remote areas, record keeping, validation of attendance -- these issues are daily concerns for all continuing education providers.

The survey was titled, "Continuing Education for Nurses via Teleconferencing," and explored five areas: geographical and population characteristics of teleconference networks; technical components and design of networks; characteristics of CNE providers in the network; intra-institutional concerns and constraints; and inter-institutional concerns and constraints. Recipients were asked to respond to a three-page questionnaire by checking statements which most accurately described their system, answering yes/no statements, and providing specific answers to short questions. Comments and elaboration were encouraged.

Survey Results

Since it was anticipated that the survey would yield information which would be representative for CE providers at large, the results were reviewed for general trends and implications, not specific data.

Response to the Survey

A total of 47 surveys were mailed to teleconference coordinators. The coordinators were generally associated with educational institutions or foundations, and 17 of them were specifically located within health field settings. It was impossible to ascertain from the other 29 coordinators' titles and institutional names how many would be dealing with continuing nursing education. From the mailing of 47, a total of 24 surveys were returned. Two of the 24 responses were in letter form, with respondents stating that they had responsibility for teleconferencing but not in health related fields. Five of the 24 returning the survey did not deal with CNE but responded to the questions anyway because they had similar responsibilities and experiences with teleconferencing in other health related fields. Seventeen of the respondents said that they actually had responsibility for continuing nursing education teleconferences.

For the purposes of this paper, the responses from the 17 CNE teleconference coordinators and the five who coordinate teleconferences in other health related fields were used. It should be noted that of the five, two reported that nurses were invited and generally included in teleconferences planned for other health professionals.

Geographical and Population Characteristics

This segment of the survey asked for descriptive information about the communities served by the networks: whether they were urban or rural, easily reached or not, and whether distance between communities and CNE providers influenced establishing the network. Responses were conclusive in that teleconferencing networks serving communities throughout the entire state by far outweighed networks serving communities in only parts of the state.

Rural areas were served more than urban. All but two of the respondents stated that climatic and geographical conditions made travel difficult, usually because of snowstorms, mountains, and road conditions; and distance between communities and CNE providers was a definite factor in establishing a teleconferencing network.

Technical Components

A number of questions regarding system components were asked. These addressed factors such as the capacity of the telephone line and equipment utilized by the network and the purchase or leasing arrangements for the equipment. Of those systems represented in the survey responses, there were slightly more four-wire dedicated systems than there were regular two-wire systems. Only one system utilized the Darome Meet-Me-Bridge. Responses regarding equipment were divided equally; half of the participating institutions owned their own equipment and half leased equipment, mainly from the telephone company. Those systems utilizing two-wire telephone lines tended to have Bell 50 A-1 speaker sets, while the four-wire systems either owned or leased Darome units.

The number of sites within each system varied a great deal. At the low end, one system reported 2-5 sites. The other systems reported as many as 119 and 142 sites. In between, the entire range of numbers was covered, with responses like 22-30 sites, 35 sites, 53 sites, 72 sites, and so on.

One survey item receiving a variety of responses was about the capacity of the system to carry more than one program at any given time. Four networks reported a capacity to run more than one program at a time. Of those four, one utilized the Meet-Me-Bridge and thus had the capacity for four simultaneous programs. Another system indicated that they had 20 bridge lines that could be coupled in any combination. The remaining two systems reported the capacity for three and five programs to be aired simultaneously. Several respondents stated that their systems do share programs with other networks and a few others indicated that they are presently investigating this. The majority of respondents said that their systems carry one program at a time and that this program was usually one of their own.

Continuing Nursing Education

Questions dealt with the absence or presence of other CNE providers on the network, whether they functioned as sites or originators of programs, whether they were ANA approved, and whether or not nurses in the area served by the network had mandatory relicensure requirements to meet. In all of the responding networks, CNE was primarily provided by a combination of universities, schools of nursing, and hospitals. Non-ANA providers of CNE could attain approval for offerings through state nurses associations. Other information indicated that some networks had ANA approved providers while others did not; some states required mandatory CE for relicensure and some did not; and about half of the respondents had other CNE providers as teleconference sites.

Intra-Institutional Concerns and Constraints

One section of the questionnaire was devoted to organizational concerns and constraints identified within the institutions. Questions and statements in this section focused on funding and administrative support, physical space, and nursing faculty recruitment.

Funding and Administrative Support. The primary sources of funding reported in the survey varied a great deal. In general, only one respondent said that costs for operating the network were supported entirely by the institution. Others indicated that funding was either generated by fees or by a combination of institutional support and fees. In a few instances, fees for teleconferences were paid by the sites. One respondent wrote, "The employer pays enrollment fees of $700 per year." Several others said that fees were a primary source of funding but that the fees were split between the site/employer and the individual. As an example, one network charges a line and equipment fee that is paid by the site and then participants pay tuition for each hour of programming taken.

Another concern of a more subjective nature reported by respondents was whether or not teleconferencing was felt to be a priority within their institutions. The responses on this were divided equally. Some of those who indicated that teleconferencing was not a priority at their institutions said the following:

> "Of all the continuing education programs done at our institution, teleconferencing ranks lowest on the list of priorities, (salaries, etc.)"
>
> "Programming, space, money, equipment have not been a stated major priority."
>
> "We're waiting for $4.00 a gallon gasoline."

Those who said it was a priority added some qualifying statements such as:

> "Teleconferencing will be a major outreach in the future."
>
> "This is a relatively new medium and we have just begun to realize its potential for many diverse purposes."

> "It is the primary media for Continuing Education."
>
> "Distance learners are a priority; teleconferencing is one delivery system."

Despite the fact that teleconferencing was not felt to be a priority at many of the institutions surveyed, all but two respondents reported that administrative resources were readily available.

Physical Space. The majority of those responding said that their classrooms were either in hospitals, clinics, or social service institutions. All but one had designated space for teleconferencing, and the majority indicated that this space was adequate. A few systems utilized rooms in public libraries. Other than this, there was no uniformity in the responses of those systems utilizing space outside of hospitals and clinics.

Nursing Faculty. Nursing faculty were generally not required to participate in teleconferencing as part of load. They either volunteered or were elicited by personal request or "overload pay opportunity." One respondent wrote "Network planners" also functioned as faculty. Another commented, "Because nursing faculty are busy, I go out of state for resources."

Inter-Institutional Concerns and Constraints

This area was subdivided into promotion, registration, on-site coordination, scheduling, and topic selection.

Promotion. Respondents were asked to provide information about responsibilities for program promotion, key advertising methods, use of computerized mailing lists, and availability of fee exempt or reduced fee spaces for promotion purposes. Responses indicated that site coordinators were responsible for program promotion at all but one of the networks. Programs were primarily advertised via direct mail brochures of a quarterly/semester calendar, and further advertised at about half the systems by individual brochures for each teleconferencing program. Slightly more than half of the networks utilized computerized mailing lists. At networks not utilizing computerized lists, addressographs and xeroxed labels were used. One respondent reported "mailing lists are maintained locally." Reduced fee or fee exempt spaces for programs were generally not available for promotion purposes.

Registration. Information was divided about pre-registration and on-site registration and revealed that registration was handled in a variety of manners. Some reported that participants could pre-register for programs by mail or phone. At some sites where the prime source of funding was from the institution, there was no fee required from participants. One site reported, "We have all registrations funneled through an existing University service that is established for collecting continuing education fees." When permitted, on-site registration was handled by the site coordinator and mailed in, or the participant completed a special form and paid at the door.

On-Site Coordination. On-site coordination was most frequently handled by paid staff although one network reported using fee-exempt participants, and two used volunteers. Nurses were most commonly responsible for assuming this role, although one network reported, "Hospitals subscribe. They then are responsible for getting someone to coordinate and moderate." Another system reported "community college learning center personnel functioned as on-site coordinators."

Scheduling. Identifying the best times and days for scheduling CNE programs did not seem to present problems for most networks. Days and times identified as most attractive to participants were Tuesday through Thursday in late morning, early afternoon, or early evening. This was determined by:

> "negotiation with liaison persons at weekly meetings";
>
> "direct feedback";
>
> "trial and error";
>
> "polling of participants and experience";
>
> "by survey";
>
> "Day and time is decided by the hospital from the available choices when they join. Each of 30 programs are repeated eight different times during a week. All are 'live'."

Factors influencing the changing of previously established program schedules were:

> "changing preferences";
>
> "availability of instructor";
>
> "audience feedback".

Topic Selection was almost always determined by formal or informal needs assessments, and was usually not influenced by what other CNE providers in the area were offering. Interestingly enough, responses indicated that teleconference topics rarely conflicted with other offerings. The use of teleconferencing was not felt to have precipitated feelings of competition amongst CNE providers; in some cases, it had even enhanced public relations and a sense of sharing. One respondent stated that providers had "met several times over the network to share program ideas"; another wrote, "This is just becoming a reality because of the energy crunch." Another stated their courses were designed to "complement" existing programs, not "compete with local efforts."

Implications and Challenges

The responses to the survey were not as conclusive as anticipated. They are useful, however, when viewed for the following implications:

1) It is apparent that teleconferencing is a solution when geographic or climatic problems need to be overcome. For energy conservation as well as for bridging prohibitive physical spaces, teleconferencing is a recognized alternative to traditional instruction. As transportation costs increase, teleconferencing can only become more attractive.

2) The technical components of a teleconference system may vary a great deal and effective programs are carried over the most basic. While sophisticated equipment and dedicated telephone lines are a stated preference for insuring good sound quality and convenience, this survey indicates neither is essential.

3) The fact that employers and/or individual sites financially support teleconference programming suggests acceptance of teleconferencing as a medium. This could be the result of pressure from potential participants who have a need to meet mandatory CE requirements or a desire to learn for personal or professional development and see teleconference offerings as an alternative. It may also indicate that employers recognize teleconferencing as a more immediate, cost effective means for providing CE than developing programs independently.

4) Since most respondents reported that money was not a motivation for obtaining instructor commitment, other incentives are necessary. In searching for faculty, qualities that might characterize potential instructors are a commitment to CE and a curiosity about instruction via a new medium.

5) Responses regarding topic selection and scheduling of programs indicated that teleconference systems attempt, whether by formal or informal means, to reflect the wishes of participants. What was not addressed in the survey is whether there is an effort made to identify new participant groups for ongoing programs or to develop offerings for previously untapped audience segments.

6) Teleconference systems can serve as an arena for developing coordination and cooperation in program delivery among CE providers. Survey results implied that this happens best when information is shared prior to actual programming.

7) Most systems reported utilizing paid personnel or, in some cases, professionals for on-site coordination. Effective on-site coordination, therefore, seems to be best managed by someone either motivated by salary or a first-hand understanding of CE.

8) Teleconferencing is obviously regarded by respondents as a viable vehicle for delivering CE programs. But whether or not teleconferencing was a stated priority, the medium can be utilized to a greater extent than it is at present.

9) While no one reported a financially thriving operation, responses indicated that teleconference systems are in relatively stable financial condition. Comments further suggested that there is a relationship between finances and the institutional priority given to teleconferencing.

The experiences at the University of Washington and the survey results have provided information upon which implications have been drawn for CE providers and the use of teleconferencing. Inherent in these implications are challenges which must be addressed.

Williams and Huntley have touched upon many current trends in CE when they state:

> "The idea that one needs to maintain competence in a profession through retraining or some form of continuing education is relatively new; yet once acknowledged, the concept appears to have achieved an acceptance and status comparable to that enjoyed by motherhood. Motivated by the consumer movement, supported by professional associations, and, increasingly mandated by state legislatures, continuing education for the professions now appears to be regarded as the panacea that will guarantee improvement of health care. . . despite the unanswered question of how continuing education relates to competency."[10]

It is safe to way, whatever its pros and cons, continuing education is here to stay and educational institutions have the responsibility of providing accessible cost effective programs. But these institutions frequently find increasing demands made upon their resources and decreasing monies made available to meet these demands. The challenge that faces providers for all disciplines is "how to maintain high quality training in the face of diminishing fiscal support."[2]

The roles of the American Nurses Association and the State Nurses' Associations have been discussed and are representative of the roles played by state and local associations for accountants, architects, dentists, engineers, lawyers, physical therapists, physicians, pharmacists, and psychologists.[10] Whether or not the profession is under mandatory CE requirements, these groups have assumed multiple responsibilities as providers, accreditors, consultants and record keepers. This challenges providers at educational institutions to meet accreditation standards, collaborate in program planning, and remain cognizant of movements within the associations.

Professional associations are not the only groups which are grooming themselves as CE providers. A CE coordinator is deluged daily with advertising brochures from other universities, colleges, publishing companies, and organizations and individuals in the private sector. CE is indeed becoming big business. Where once the educational institution may have been the sole provider, multiple options are now available. The challenge for institutions is, therefore, to draw upon their resources and offer the highest quality programs, of a standard that is difficult with which to compete. The second challenge is to remember the potential participants in remote areas that are not as readily available an audience, and yet have desperate CE needs. While providers whose prime interest is profit may choose to ignore these professionals, the educational institution has a responsibility to acknowledge them. The choice of teleconferencing to meet these needs and fulfill these obligations is an obvious one.

There have been studies which indicate that there are no great differences between learning from face to face contact or learning via a telephone communications system.

> "What appears to be most important in any learning approach is that the learner have an opportunity to interact with the instructor, which a teleconference approach does allow. It also allows the more reticent participant to voice questions without the hesitancy sometimes induced by face-to-face interaction with an instructor."[2]

But the fact that learning can and does take place via teleconferencing does not necessarily assure that it will. Indeed,

> "the potential advantages of teleconferencing may never be realized if the applications are forced to fit existing models of education. . . . Similarly, if education by means of teleconferencing retains the model of experts assembling learning packages for broad distribution, the potential for tailored learning experiences or for individual learning networks will be wasted. Education will continue to reflect the concepts which the instructor thinks are important rather than the questions the student might bring to the instructor."[5]

Providers and faculty alike are challenged to develop and implement creative experiences worthy of this innovative medium, where mutual learning is facilitated.

The interesting question which has not been addressed, and is indeed a Pandora's box, is well stated by Kuramoto: "there has been little evidence supporting the concept that continuing education guarantees competency to practice."[7] The ultimate goal of any CE offering is to improve services rendered by the professionals to the public. And yet, hard data to document these improved services based on CE is almost nonexistent. If providers at educational institutions feel a commitment to the concept of CE, then they must accept the challenge to prove that it does make a difference. Evaluations of workshops based on participant satisfaction and happiness quotients will not suffice. However, periodic reinforcement of workshop content and follow-up evaluations could provide the data needed to validate the importance of CE. What better way to utilize teleconferencing?

At this time "there is a growing conviction that the full potential of instructional technology is not being realized."[8] The survey responses suggested that people closest to teleconferencing are most cognizant of its untapped potential and are observing a kind of waiting period. On their shoulders rests the challenge of assuring its utilization and support by institutions and participants alike. Continuing education providers must be prepared to accept the fact that this challenge is mutual.

The experiences at the University of Washington School of Nursing were initially a source of ambivalence and, perhaps, even discouragement. Yet the survey results indicated that this first experience was not necessarily a typical one. Teleconference and continuing education providers must be committed to overcoming initial organizational stumbling blocks and establishing refined networks to meet present and future challenges.

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DISTANCE EDUCATION IN THE CANADIAN ARCTIC: DEVELOPING AN ALTERNATIVE DELIVERY SYSTEM

Dr. Dwight R. Thomas
Director, Inuit Management Programme
University of Regina
Faculty of Administration
Regina, Saskatchewan
S4S 0A2

The utilization of distance or remote learning systems for the delivery of educational programming is growing at an accelerating pace. Both traditional institutions as well as those dedicated to "distance learning activities" have made considerable progress in the development of curricula and in the design of multi-media delivery mechanisms. This paper reports on the development of one such scheme which is being devised to serve the needs of students living in isolated settlements across the breadth of the Arctic regions of Canada. The paper first directs its attention to the unique milieu of the largely Indian and Inuit (Eskimo) target student populations. It then focuses upon the problems and limitations of existing conventional delivery systems in providing educational programming to the isolated settlements of the North. The paper next considers the opportunities which current off-the-shelf microcomputer and teleconferencing technology can provide in devising alternative delivery systems (the system at the University of Regina is highlighted). The paper concludes with some observations concerning the future potential for microprocessor based interactive systems and suggests avenues for future development and application.

The Programme Milieu

In 1978, the University of Regina was approached by the Canadian Arctic Co-operative Federation Limited (CACFL) with the view to determining whether we could provide them with management development training assistance. CACFL is a parent organization which represents some 37 co-operatives which are located across the 1.3 million square miles of Canada's Northwest Territories. Each co-operative is a locally-owned enterprise which serves the local population's retailing needs in communities whose residents are largely of Inuit (Eskimo) or Indian ethnic origin. Historically, management personnel for these institutions have been recruited from southern Canada but it has long been the desire of the co-operatives to employ as many local indigenous people as practical. To this end, the University's Faculty of Administration was requested to develop and implement a programme of university degree credit classes in administration to assist in the development of this local management potential. Since we had previous experience in working with indigenous groups, we were pleased to accept the assignment. The curriculum to be developed was of concern but the mechanisms for programme delivery were of even higher priority. How could we launch such a programme to reach dozens of students residing in as many locations? The logical response to this question would suggest one of three traditional alternatives. First, we could arrange to have the students gather at one or several central locations in the Arctic and proceed by employing a normal classroom approach. Alternatively, we could arrange to bring instructional personnel to each community for short periods of time to provide local tutoring and instruction. A third approach would involve the development of a conventional package which would be made available to the students. While all of these formats have been used in the past, there is considerable evidence to suggest that each has met with a very limited degree of success.

The concept of centralized classroom instruction (over significant periods of time) tends to conflict with the lifestyle and culture of the northern Inuit and Indian students. Since most of the student population live in remote settlements, the centralized classroom approach would mean that many would be required to absent themselves from their homes for extended periods of time. Inuit and Indian people living in the Arctic continue to consider the activities of hunting and fishing to be an important component of their lifestyles. Even though a large number do not rely on these activities solely for economic reasons, to leave one's home community thus disrupting these activities would not be popular. As well, the indigenous family unit is far more cohesive than we would expect to find within the predominant southern culture and this factor also tends to dissuade many potential students from participation.

Utilizing the concept of travelling instructional personnel has much to commend it. Unfortunately logistical considerations have made this mode of instruction impractical. Many locations in which our student population resides are serviced only infrequently by scheduled airline while others can only be accessed via charter flights. As well, since learning modules would require at least three- to four-week sessions on a full-time in community basis, the number of instructional personnel needed to cover off the thirty-seven locations would be prohibitive. Using correspondence tuition would also create difficulties. Because a number of communities have only limited postal services, it would be a hardship to administer such a programme to such settlements. More importantly, it has been the experience of educators, at the University of Regina and elsewhere, that Inuit and Indian students are more effectively motivated where audio-visual and oral rather than written communication techniques are employed. With this knowledge at hand, we set out to develop a more effective system.

The Alternative Delivery System

Recognizing the need for an interactive communications system, the University's Faculty of Administration and Department of Computer Science set out to develop a system which would be acceptable to the student population as well as cost effective. With the financial assistance of IBM Canada Limited (through their University Fellowship Programme), we explored several options and came to a number of conclusions. Since virtually all communities in the Northwest Territories are served with generally reliable telephone services, the utilization of telephone facilities as part of our delivery mechanism had strong appeal. Although the use of direct satellite-to-ground communications is on the verge of commercial viability in the Arctic, this remains in the developmental stage and network availability could be relied upon at this time. As well, the costs of leasing such systems would likely exceed the total capital and operating costs of our entire project! Given the foregoing, the University of Regina systems was designed to be comprised of the following components:

A. Lesson Notes:
An extensive package of lesson notes will be provided to each student. These will provide scheduling information, course enrichment materials and exercises for students to complete at their own pace in conjunction with the textbook.

B. Audio Cassettes:
Complementing each topical area, students in each community will be provided with sets of audio cassettes which we hope can assist them in studying and reviewing each topical area. Similar in format to the Audiovision Cassettes employed by the Open University, the cassettes will be used to provide audio support in explaining graphical illustrations, tables, and specific concepts for which some remedial assistance may be needed.[1]

C. Teleconferencing:
On a regular basis, network teleconferencing tutorial sessions will be conducted to highlight the textual and lesson note materials. As well, the use of Darome Miniconvenors will allow for meaningful verbal interaction between students in each settlement with each other and with the instructor. An additional advantage of the teleconferencing mode will be to allow multilingual (Indian and Inuit dialect as well as English) resource persons to sit in on each session. From our past experiences we believe that such a facility may be of particular assistance to students in some course areas where their knowledge of English is limited.

D. Video Cassettes:
The use of video cassettes will be employed to provide programme enrichment. Although it is our expectation that some video materials will be of the "educational film" variety, our primary objectives in employing video are several. First, it has been our experience that Inuit and Indian students identify very positively with indigenous instruction in a classroom context. To take advantage of this observed behavior, we will be producing video cassette materials which involve the students and other indigenous people in the context of discussing pragmatic problems related to the course content. In addition, we expect to use the video cassette medium to provide for some experiential role-playing exercises.

E. The "Electronic Blackboard":
The foregoing components of our delivery system provide, with the exception of the audio teleconferencing component, an extended correspondence class orientation. To provide for further interaction, the

University's Department of Computer Science has developed a microcomputer-based "electronic blackboard" which will initially provide for the one-way transmission of graphics to each "classroom location" from the originating site. The system, which is discussed in further detail in the paragraphs that follow, can be employed whereever we have access to unconditioned telephone lines and provides output to a standard video monitor or television receiver.

Some further comments concerning the microcomputer-based link are appropriate here. The "electronic blackboard" is designed around Cromemco Systems 2 computers. These systems were selected because of both their S-100 buss configuration (which is becoming an industry standard) as well as for reasons of ruggedness and reliability. Also, the existing software for these units includes both the BASIC and PASCAL languages--and the software development of this system and that of the Open University "Cyclops" (the only established similar system which we could identify) are compatible with these programming languages.[2] A final consideration was more pragmatic in nature. The Cromemco computers could be used as a powerful microcomputer in small business applications within each northern co-operative--and we felt that this "alternative use" for the hardware should be encouraged.

The hardware components for this "electronic blackboard" are readily available "off-the-shelf". Essentially the system is configured thus. The instructor employs a tablet with a usable area of approximately 11" x 11". Using a special stylus, any freehand X-Y coordinate data can be "written" on this surface. This tablet (which is more commonly referred to as a "digitizer or bit pad") is connected serially to the host microcomputer. The "written graphics" are instantaneously visible on a connected video monitor and are simultaneously transmitted via a hard-wired or acoustically-coupled data modem to the remote locations--initially we contemplate five or six centres per transmission. At each student location, a modem (once again connected to a standard two-wire unconditioned telephone line) receives the signal, transmits it to a microcomputer which when coupled with an rf modulator will provide a "blackboard reproduction" of the tablet data transmitted on a local television receiver.

The software required to develop this system has had to be developed at the University. For those reading this paper who have some computer science background, it will come as no surprise that probably 75% of our time and effort thus far has been devoted to the software needs of the system--and much remains to be done. At the current stage of development, for example, the instructor needs to utilize a computer terminal to provide instructions to the system related to the status of data being "written" on the tablet--erase, draw, save, recall, transmit, and quit commands, for example, must be entered into a keyboard. However, as the system is operationalized over the next six months, we expect that all "commands" will be software controlled from the tablet or digitizer thus allowing for "hands on" use by a non-computer-oriented instructor. The current system configuration also allows for partial erasure on the screen such than an instructor can erase figures or parts of his "blackboard" drawings at will. The system also makes provision for the storage of images on floppy diskettes in order that a series of images or graphic illustrations can be transmitted prior to a specific teleconferencing session and the display of such stored data could then be controlled by either the instructor remotely or by students at each classroom location.

Although we have tested the "electronic blackboard" in the foregoing configuration, much remains to be accomplished. As was noted earlier, the software development has been slow and difficult due, in part, to a lack of programmer resources. We have had discussions with the Open University in Britain concerning this problem as they have previously developed a similar system entitled "Cyclops" and have done a good deal of software development employing the PASCAL language. We are optimistic that these software difficulties will be resolved over the next several months. As well, we understand that Bell-Northern Research of Ottawa, Ontario, are engaged in the development of a parallel system and we are in contact with them concerning the nature and availability of their device. Some further anticipated extensions to our system are also being considered. First, we hope to make the "electronic blackboard" a truly interactive two-way device in order that students can utilize it to communicate with the instructor and students at other locations. We are currently evaluating various hard copy printing devices and hope to provide this facility as well. Finally, there is the question of colour. Our current system operates in a black and white mode. However, colour transmission is possible if we can solve the data transmission difficulties inherent in sending more data to facilitate colour images. There are a number of data compression devices available which could improve our transmission speed (in colour or black and white) but these are currently being marketed at a price which we believe to be uneconomical in our application. In summary, we are pleased with the progress which has been achieved over the past eighteen months.

Future Expectations

The microcomputer-based "electronic blackboard" has an important role to play in the extention of educational programming in the community. In our current application, it provides a viable method of complementing existing delivery mechanisms to a population which cannot be effectively reached by conventional means. For our institution, there are other applications as well. Extending teleconferencing coupled with the graphic support of a blackboard will allow for a much broader reach in the rural areas as well. As with most post-secondary institutions, the University of Regina is faced with the financial constraints of the 1980's. In order to serve the needs of an ever-widening constituency of interests, we require a multi-media delivery system which can allow a limited teaching staff to serve a larger number of student groups--the "electronic blackboard" can assist in this endeavour.

From a broader perspective, there are excellent prospects as well. As a participant at the Open University Conference on the Education of Adults at a Distance, I became aware of the interest and potential for this type of delivery system in both developed and developing nations. Since the system employs off-the-shelf microcomputer technology (with a declining cost trend in the industry) and requires only unconditioned telephone lines it provides a low-cost extremely flexible system amenable to any cultural setting or instructional application. The key to system enhancements focuses upon the system software--and we are convinced that software packages will become cost effective as they have in the area of business applications for microcomputer-based systems.

Footnotes

[1] In the Fall of 1978, the author attended a course entitled "The Short Course on the Open University" which was held in Milton Keynes, England. The use of audio cassettes keyed to textual materials (Audiovision) was most impressive in its form and high quality.

[2] In our discussions with Dr. Graham Read of the Open University, it became clear that the developmental work employed in designing software for their Cyclops system might be transferable to our system. For more information, the reader is referred to G. A. Read, Cyclop - An Audio-visual System, published by the Open University Press (1978).

THE OHIO MEDICAL EDUCATION NETWORK, NORTH AMERICA'S LARGEST TELEPHONE NETWORK FOR PHYSICIANS --A DIRECT DISTANCE DIALING APPROACH TO TELECONFERENCING

Arthur A. Bartfay
Networks and Media Coordinator
The Ohio State University
Columbus, Ohio

For over 2,000 physicians each week, the answer to keeping up to date on advances in medicine is OMEN (the Ohio Medical Education Network). OMEN is a hospital based two-way interactive telephone communications system that brings medical faculty at four medical schools in contact with physicians at over 140 hospitals in 12 U.S. states and two Canadian provinces. Past trends suggest that, during the upcoming 19th year of the network's existence, it is very possible that even more physicians and hospitals may choose to take advantage of the medical programs.

OMEN has been a leading pioneer in the use of QKT voice coupler telephones tied to amplifiers and loudspeakers at the receiving hospitals. While other "teleconferencing systems" are currently in wide vogue, the success of OMEN has demonstrated the viability and advantage of a direct-distance dialing approach in the medical field. It is a simple system that permits OMEN to link together hospitals as far apart as Pottsville Hospital and Warne Clinic in Pottsville, Pennsylvania; Cape Canaveral Hospital in Cocoa Beach, Florida; and Swift Current Union Hospital in Swift Current, Saskatchewan, Canada. Through the Ohio Medical Education Network, the concept of a many thousand square-mile classroom has become a reality. And, the physicians at such locations can figuratively "rub elbows" with one another and make comments to one another and the expert panelists--without ever leaving their communities. They can question one another and make comments to one another, even though most of them will never meet each other in face-to-face situations.

This paper will discuss our approach to networking. First, we will give a brief history of OMEN. Next, I will describe how the network operates from a member's perspective, as well as from the network's perspective. Also, I'll discuss some of the advantages of this particular kind of networking system.

1. OMEN: A BRIEF HISTORY

OMEN began in 1962 with 12 central Ohio hospitals receiving 13 hour-long, once-a-week programs, broadcast on two FM radio stations. Questions were transmitted to Columbus by microphones at the hospitals which were attached to Class D broadcast lines. During the first 12 years of the network, OMEN expanded while using this system. But the changing nature of American FM radio caused a different transmission system to be developed and to be initiated in the fall of 1974. The direct dial telephone was adopted as the new method of transmission. And, it has been those six years which have proven to be the ones of unsurpassed growth and progress for the network.

From a hospital membership of 58 in the 1973-74 season (OMEN's last as an FM radio network), OMEN grew slowly but steadily to a hospital membership of 64, 73, 95, 109, 126, and most recently, to over 140 hospitals. While the 12 year total attendance of the radio network was 150,500, the attendance for the last six years of the telephone network has exceeded 230,000. (This makes a grand total attendance of over 380,000 in the first 18 years of the network's operation.)

2. FORMAT OF THE PROGRAMS

OMEN combines the visual impact of slides with two-way interactive discussions in a once-a-week program that currently airs 30 weeks a year during the lunch hour, from mid-September through the first days of May. The programs are transmitted each weekday (Monday through Friday) with a different topic being covered each week. However, participating hospitals receive the programs once a week on their pre-selected day of participation. (Some hospitals take part on Monday, others on Tuesday, and still others on Wednesday, Thursday, or Friday.)

Also, since February of 1978, OMEN has been presented at two different times--not only from noon to 1 P.M., Ohio Time, but also from 12:30 P.M. to 1:30 P.M., Ohio Time. In the 1979-80 season, for example, programs were aired Monday through Friday from noon to 1 P.M. But, on Tuesday, Wednesday, and Thursday, they were also aired from 12:30 P.M. to 1:30 P.M. Thus, the same topic was presented eight times in the course of the week, with the two-way discussions being "live" and different for each of the eight programs. Over the course of the 30 week season, 240 hour-long OMEN programs were presented during the last year.

The first 30 minutes of each program is devoted to a slide/lecture presentation by two physician-panelists, usually with disparate and complementing specialties. Panelists are drawn from the medical faculties of The Ohio State University in Columbus, the University of Cincinnati, the Case Western Reserve University in Cleveland, and the Medical College of Ohio at Toledo.

As each speaker presents his talk, he calls for appropriate slides to be projected in the conference room of each hospital. (Two-by-two color slides have been numbered on the film and sent to each hospital by the United Parcel Service in advance of each program.)

The 30-minute lectures have been pre-taped to assure lecture quality and to eliminate the need for the two panelists to present the same lecture each day for five consecutive days. Also, it allows the panelists to literally be "in two places at the same time," which is currently a necessity since "double header" programs are aired on three days. On Tuesdays, Wednesdays, and Thursdays, we start the taped lecture in Studio A at Noon for the first group of hospitals. At approximately 12:30 P.M. the panel then begins to answer questions from the audience of the first group of hospitals. Meanwhile, down the hall in Studio B, at 12:30 P.M., we start playing the taped lecture for a second group of hospitals. When the panelists are finished answering questions in Studio A at approximately 1 P.M., they walk down the hall to Studio B where the taped lecture is ending for the second group of hospitals. They, then, proceed to answer questions for the second group until 1:30 P.M.

By repeating each topic eight times, the number of hospitals that participate in any one program can be limited, while still allowing an increasing number of hospitals to take part in OMEN. During this past season, as few as 13 and as many as 21 hospitals took part in any one of the hour-long programs. This small seminar approach insures that ample opportunities exist for physicians at all hospitals to actively participate in the discussion periods and "zero in" on their own particular needs. The closed-circuit nature of the network frequently fosters lively listening for all physicians in the audience.

Hospital members of OMEN participate in the "live" discussion periods by making use of their second telephones and the confidential Columbus phone number that has been supplied to them solely for their use on their day of participation. When a member hospital calls, a light appears on the telephone call director in the OMEN control room. The light indicates which hospitals are calling in. The program moderator serves as a "traffic officer" and calls on each hospital for its comments.

3. SUPPLEMENTARY MATERIALS AND SERVICES

About 17 days before each Monday program, OMEN mails a "program package" to each hospital. In this package is a set of numbered two-by-two color slides, usually between 20 and 30 different slides. Each slide is numbered on the film and on the outside edge. During the lecture portion of the program, the physicians call for the slides by the numbers: "slide one please," "slide two please," etc. This numbering assures that each hospital is showing the proper slide at the proper time.

The program package also includes a supply of program outlines with teaching objectives and journal references. (These outlines are usually two or three pages in length, but at times are very detailed.) Enough outlines are sent so that one can be distributed to each physician in attendance.

In addition, an attendance sheet is sent, as well as a number of posters which may be put in the hospital to publicize the programs. Audio cassette copies of the lectures are sent to those hospitals ordering them. Two-thirds of the hospitals do order a cassette and they keep it, together with the slides, in the hospital's medical library.

In advance of the season, each hospital is sent an OMEN notebook so that they may keep their program outlines in the hospital's library for ready reference. To help the hospital in publicizing the program, OMEN also sends--to each member of the medical staff--an attractive brochure which lists the names of the participating hospitals plus the topics and panelists for the forthcoming season. The brochure is mailed just prior to the beginning of each season.

4. THE TELEPHONES USED IN THE OMEN SYSTEM

To participate in OMEN, each hospital needs two telephones. One telephone (a "regular" phone) is used to call in questions and comments during the program. The second telephone (a QKT voice coupler phone) is used to receive the programs and is hooked up to the network-specified amplifiers and loudspeakers at the hospital. New members buy the amplification equipment through arrangements facilitated by OMEN and it becomes their property. This assures the hospital of outstanding sound quality in program reception.

Member hospitals pay all costs associated with their telephones, including long distance charges. OMEN provides hospitals with a detailed Procedure Manual to help them with the installation and operation of their equipment.

QKT voice coupler telephones are commonly used today by radio stations to get their play-by-play sports broadcasts back to their stations from distant cities. As used in the OMEN programs, the use of the coupler phone permits the receiving hospital to pull up a simple plunger, located in the phone's cradle, and thereby allows the hospital to bring the audio material that OMEN is feeding into the hospital's amplifier and loudspeaker. (The QKT voice coupler phone is connected by a cord to the amplification equipment.) The coupler phone also has a mechanism which disconnects the mouthpiece of the telephone, so that unwanted feedback does not result at the receiving hospital.

In the OMEN control room, we also have QKT voice coupler phones. There are enough phones to handle the maximum number of hospitals currently participating in a particular one hour program. The OMEN program feed goes from our studio into three automatic distribution amplifiers (multi-channel line drivers), such as are commonly used by radio stations to feed a sports network. We can individually adjust the volume level of the program for each hospital receiving the network feed. When the plungers on our coupler phones are pulled up, we bring the OMEN program into our telephones thus allowing it to be transmitted to the participating hospital.

A few minutes prior to the beginning of each OMEN program, participating hospitals call the confidential number of their pre-selected coupler phone in Columbus. Thus, through the use of voice coupler phones, in Columbus and at the participating hospitals, OMEN members can make the connection that results in their reception of the OMEN program.

To receive the phone calls from the hospitals wanting to ask a question or make a comment during the discussion periods, OMEN has a telephone call director. This is a box supplied by the phone company that has at least 20 buttons. One button is needed for each of the hospitals participating in the discussion period. (This is a standard telephone call director such as might be found in a busy office or company in which a secretary answers the company phone number and then switches the call to one of the extension phones in the office.) When the button is pushed, this puts that line "on the air" so that everyone can hear the question or comment voiced by one of the hospitals. After that person's query is responded to, we then move on to the next light showing on the board for the next questioner.

From the network's perspective, therefore, the economics of using such a "two-telephone system," depends upon the cost of installing and paying the monthly service charges for the required number of phones. These charges will vary depending upon the rates for these services that have been approved by each state's public utilities commission.

In actual practice, we presently have two studios and two "coupler telephone rooms" which permit us to service over 140 hospitals in two shifts. However, any new network which attempted to utilize our system would probably (just as we did, except since February, 1978, when we started using two shifts) make use of only one studio and one "coupler telephone room." Using this approach, approximately 100 hospitals (or other locations) could be accommodated if five hour-long programs were aired. In our case, 21 QKT voice coupler lines and a 20 line call director are used in the one studio and the one "telephone coupler room." The annual cost of the telephones in Columbus, Ohio, in April, 1980, using our approach was:

$1,700	for the installation of the 41 telephone lines
3,125	for eight months of service on 21 coupler phones
3,280	for the 20-line call director
$8,105	

In the case of OMEN, many of our programs originate from other medical schools. Our panelists are located in these distant cities (Cleveland, Cincinnati, and Toledo) though the programs are moderated from Columbus. Cost estimates for these kinds of remote programs, should you be interested in doing them, would clearly best be obtained from your local telephone company. But, the use of out-of-town panelists substantially adds to the costs of the system.

NOTE: At the time that this article was being written, OMEN learned that The Bell Telephone Company will discontinue providing the QKT voice coupler telephone except to those who have them now, keep them in year-around, and thus would be "grandfathered." We are only learning at this time that a slightly different arrangement will need to be employed next season for our networking system, but we do not precisely know what that minor adjustment will be.

5. THE OMEN STUDIO

Our system also makes use of a studio which is equipped similar to a radio broadcasting studio. Tape recorders are needed so that a program can be taped, edited, and played back for the member hospitals. Microphones for each panelist and the moderator are used during the two-way interactive discussion periods.

Our studio contains a custom built "control board," although a standard audio board, adapted for network purposes could be used. The input lines to the control board include: (1) three microphones, (2) the tape recorders, (3) the telephone call director, which allows questions and comments from the hospitals to be fed on the system, and (4) the "remote input," which allows the panelists from distant locations to be heard.

The cost of such a studio will vary depending upon the cost of the control board, the microphones, the tape recorders, and the cost of preparing a room acoustically for program origination purposes. A local audio engineer can give you a better estimate of the costs involved. If you already have access to such a studio, these costs can be eliminated or minimized.

6. SOME ADVANTAGES OF THE OMEN COMMUNICATIONS SYSTEM

After working with our system for six years, a number of advantages of the system have become apparent to us. One distinct advantage of the OMEN system, as compared to any other system, is the ease with which distant hospitals can be added to the network. It is just as easy, and no more costly to us, to add a hospital in Cocoa Beach, Florida, to OMEN, as it is to add a hospital just a few miles from Columbus. Even hospitals in another country (like Canada) are easily added.

Another advantage is that our system assures the member hospital of a quality audio feed. The subscriber's phone is hooked up to a high quality amplifier and loudspeaker at the hospital. Thus, we provide excellent service not only to the small hospital with several physicians in attendance, but also at the large hospital where 50 or more physicians may attend the program in an auditorium.

Program quality can suffer with the use of a portable conference telephone since the microphones in the unit are "on" at all times at all participating locations. Thus, extraneous noises in the various rooms (such as coughs, laughter, moving of chairs, whispering, etc.) put "noise" on the system that can cause a deterioration in sound quality. Also, while a portable conference system may be appropriate when all of the participating locations are relatively close together, the further apart the locations are, the more the sound deteriorates for everyone else taking part in the system.

Then, too, from the standpoint of staffing and operating a network, considerable effort is spent in setting up conference calls to make use of the portable conference phone. In the OMEN system, one person in a telephone room can handle the incoming calls from hospitals prior to the program. Hospitals can quickly be connected to the OMEN feed. And, since we have an individual volume control for each hospital feed, we can raise or lower the volume for each hospital, if necessary.

Using the OMEN system, we do not need to be concerned with how much it costs for long distance charges from one city to the next. This is because we do not call the hospitals. They call us and therefore they pay for the necessary calls. Subscribers join the network only if (after considering other options), they feel that the program would be cost effective for them. In the OMEN system, the subscribing location can know exactly what part of the total cost of the program is clearly and directly attributable to the phone company. In other systems, they may realize this--vaguely--but not as directly. Typically, in other systems, the cost of the lines or the calls are paid for by the system. Then, each hospital is assessed a fee to pay for his "fair share." Thus, most systems "bury" the cost of the telephone lines in their "administrative service fee."

At the present time, using the OMEN communications system, we only deal with the telephone companies. The fact that we do not rent or lease special equipment from any private firm simplifies network operations for us. If anything goes wrong with the equipment in Columbus or at the member hospitals, the telephone company fixes it. In Columbus, and at the member hospitals, regular payments are made for installation and monthly service charges on normal phone company equipment.

If for some reason, our network should face an economic collapse next year, we would not be "stuck" with equipment for which we had no use. If our network should experience growth--slowly--then, we can add the needed phones. On the other hand, if our network has some membership reverses, we can cut down on our costs by reducing the number of phones ordered from the phone company.

A final difference between our system, and others which employ different methods, is that our two-way discussions periods are much more "structured." When a hospital calls us, their light "blinks" on our call director board. We can tell who is trying to call in. The OMEN moderator in Columbus acts as a "traffic director." He determines which hospital gets to ask its question first, second, third, etc. He can determine how many questions each hospital may ask. If many hospitals are calling in, the moderator can mention that on the air. He can then limit everyone to one question and ask them to dial back if they have further questions. This prohibits any one participant from "hogging" or "dominating" the discussion with many questions, as sometimes happens in oral discussions.

7. PARTICIPATION IN THE DISCUSSION PERIODS

In the 1978-79 season, the last season for which we have complete statistics available, 126 hospitals took part in the 30 weekly program topics that were aired. Each topic was covered in seven 60-minute programs with seven "live" discussions. Thus, 210 hour-long programs were aired.

The amount of participation in the discussion periods varies according to: (1) the hospital, (2) the program topic, and (3) the specific discussion period. Some hospitals call in more often than others. But 20 percent of the hospitals (25 of 126 hospitals) took part in the discussion periods of one-half or more (at least 15) of the 30 programs. Most hospitals (54 percent--or 68 of 126 hospitals) called in for at least one-fifth (six or more) of the 30 programs. Almost all hospitals (92 percent--or 116 of the 126 hospitals) called in to ask a question in at least one program during the season.

The most popular weekly topic in the 1978-79 season was a program on "Anti-biotics." It attracted questions from 49 hospitals (39 percent of the membership) during the course of the seven one-hour programs. Four other topics received questions from 45 or more hospitals during the season. As you can see below, most of the topics elicited considerable response from the hospitals.

PERCENT OF PROGRAMS RECEIVING
CALLS FROM HOSPITALS

40% of programs--Received calls from 40 or more hospitals
70% of programs--Received calls from 30 or more hospitals
93% of programs--Received calls from 20 or more hospitals
100% of programs-Received calls from 19 or more hospitals

Even for the two weekly topics that had calls from only 19 hospitals, that amounted to an average of 2.7 hospitals calling in during the average discussion period. And, many of these hospitals asked several or more questions.

Looking at the participation in specific discussion periods, we find that a program on "Sports Medicine" aired Monday from noon to 1 P.M. attracted a question or comment from 55 percent of the participating hospitals. Thus, 11 of the 20 hospitals took part in the discussion period. An even higher percentage of hospitals (64%) took part on three separate occasions during the season on the Wednesday programs aired from 12:30 P.M. to 1:30 P.M. Nine of the 14 member hospitals asked at least one question or made a comment in those discussion periods.

When one looks at each of the seven discussion periods aired during the week and averages them during the 30 weekly programs, we find that on Mondays (from noon to 1 P.M.), 31 percent of the hospitals participated in the average discussion. That's an average of 6.1 hospitals out of 20 taking part in the average Monday program. An even higher percentage of the hospitals (44%) took part in the programs aired on Wednesdays (from 12:30 P.M. to 1:30 P.M.). Though only 14 hospitals were in the audience for that specific discussion period, they also had 6.1 hospitals calling in the minimum of at least one question for the average discussion during the course of the season.

Overall, when the averages of the averages are reviewed for the 210 discussion periods, we find that exactly five hospitals called in for the average of the 210 individual discussion periods. Thus, during the course of the seven hour-long programs, the mean-average weekly topic attracted calls from 35 hospitals, which amounts to over one quarter of the hospitals (27.6 percent to be exact) participating in the average weekly program.

8. WHO BELONGS TO OMEN?

In terms of bed-size, the 1979-80 network had 52 hospitals with 200 or more beds, 52 hospitals with 100 to 199 beds, and 38 medical facilities with less than 100 beds. Actually, two of the medical facilities were clinics, with no patient beds at all. The largest member hospital had over 1,200 beds.

OMEN hospitals are found in rural areas, as well as various sized cities. This past year, the network reached into Chicago, Illinois; Detroit, Michigan; and suburban Nashville, Tennessee. Also, all six of Ohio's most populous metropolitan areas have OMEN member hospitals--Cleveland, Cincinnati, Columbus, Dayton, Toledo, and Akron/Canton.

OMEN member hospitals are well distributed throughout the state of Ohio. Of the 80 counties in Ohio having at least one hospital, each one either has an OMEN member hospital OR is adjacent to at least one county that has one or more OMEN member hospitals.

Our more than 50 out-of-state members include three hospitals in Canada. St. Joseph

Hospital in Sarnia, Ontario, joined us in 1975. More recently, hospitals in Elliot Lake, Ontario (east of the upper peninsula Michigan city of Sault Ste. Marie) and Swift Current, Saskatchewan (north of Malta, Montana) joined us. Member hospitals are located in 12 states: Alabama, Arkansas, Florida, Illinois, Indiana, Iowa, Kentucky, Michigan, Pennsylvania, Tennessee, and West Virginia, as well as Ohio.

The key to the success of OMEN has not been an "open door" or "revolving door" policy, whereby new members join by one door and old members leave by the other door. In fact, it has been just the opposite. Members tend to remain members. For example, in the summer of 1979, we received membership renewals from 97.6 percent (123 of the 126) member hospitals. In each of the last four years, at least 95 percent of the member hospitals have renewed for the subsequent season.

A total of 53 of the present member hospitals first joined OMEN 10 or more years ago, with 37 of those hospitals boasting memberships that go back 15 or more years. Ninety-two hospitals have been members for at least four years. Considering the fact that the network has grown from 58 hospitals in 1973-74 to 142 hospitals in 1979-80, this is an enviable record of membership support and satisfaction.

9. FINANCING THE NETWORK

One source of income for OMEN is grants. But, the major source is from the growing number of subscribers to the network. By operating a 142 hospital network, 30 weeks a year, the Ohio Medical Education Network administrative fee for member hospitals has been maintained at an attractive and reasonable level.

On an annual basis, the administrative charge for the 30 weekly programs is levied, based on the bed-size of the member hospital. This past season, hospitals with less than 100 beds paid $660, those with 100-199 beds paid $720, those with 200-299 beds paid $810, and those with over 300 beds paid $900. Thus, the per program charge ranged between $22 and $30 plus local telephone charges to receive the programs.

10. CONCLUSIONS

The OMEN telephone system was adopted six years ago, after 12 years of experience in operating a medical network on FM radio stations. The two-telephone system was developed independently of other networks, without knowledge of whether it was being used elsewhere in quite the same manner.

Since then, we have learned that an approach similar to this has been used on an occasional basis for meetings. Also, one medical network attempted to use this system recently, but then decided to discontinue their networking efforts. Clearly, this approach is not for everyone, but so far, at least, it has been a viable approach for the Ohio Medical Education Network. Thus, we look forward to our nineteenth year of operation.

TELECONFERENCING AND TRINITY UNIVERSITY'S EXTERNAL MASTER'S DEGREE PROGRAM IN HEALTH CARE ADMINISTRATION

Ted Sparling, Dr. P.H.
Director

Center for Professional Development in Health Administration
Trinity University
San Antonio, Texas

The use of teleconferencing in formal education is well documented in the literature.[1,2,3,4,5] However, there is no evidence in the literature of its use in a non-traditional mode similar to the structure of Trinity University's External Master's Degree Program in Health Care Administration. The purpose of this paper is to examine some issues and experiences concerning Trinity's External Master's Degree Program and the importance of teleconferencing as a supplement to on-campus instruction.

The Center for Professional Development in Health Administration

In the spring of 1976, Trinity University, San Antonio, Texas, received a Kellogg Foundation grant[6] to establish a Center for Continuing Education in Health Administration to improve educational offerings to health administrators throughout the Southwest United States and to establish programs of increased value for those whose work required administrative understanding.

The Grant was a result of the desire of the Trinity University Department of Health Care Administration to study continuing education needs for practicing health care administrators whose needs, they felt, were not being well met. This conclusion, reached through their own perceptions, was strengthened by the findings of the Commission on Education for Health Administration[7] which identified the inattention and lack of coordination which, they stated, characterized the continuing education and lifelong learning offerings in the area of health care administration.

In order to be consistent with the major recommendations of the Commission on Education for Health Administration, the Center established the following objectives:

1. To up-date the existing skills and knowledge of practicing health administrators by offering programs which present new developments, theoretical and practical knowledge, and techniques in health care administration. Such programs to be developed through a systematic and integrated sequence of courses. The programs will be structured to help administrators who wish to improve their effectiveness in their present positions, as well as those upwardly mobile administrators who seek advancement to more demanding administrative positions.

2. To up-grade the knowledge and skills in the basic aspects of health care administration for individuals trained in areas other than health administration, including physicians, other health professionals, and middle-management personnel who have not had previous opportunities to obtain such education. Also included were individuals who serve in collateral roles to the administrator, including hospital trustees, board members of other health agencies, and managers of health-related organizations and activities such as health insurance companies.

3. To develop non-traditional programs of various types, including non-resident graduate and undergraduate coursework offered through a variety of curriculum models. Academic credit to be offered wherever appropriate. Course offerings to be carefully evaluated to insure their quality and possible integration with degree programs already offered at Trinity. Since many qualified individuals are unable to earn degrees in health administration on a full-time, residential basis, the coordination of continuing education with professional and inservice training programs will be an important aspect of the Center's efforts.

4. To provide training programs in developing sub-specialty fields such as mental health administration and long term care administration. Consideration also to be given to other specialty programs as the need and demand may warrant, for example, health planning and Health Maintenance Organization administration.

5. To conduct and sponsor research and experimentation as well as systematic evaluation of courses and programs in the life-long learning and teaching of health administration. Studies to be conducted on the efficacy and effectiveness of curriculum content and teaching methodology, along with research into the specific areas of skills and knowledge most needed by practicing health administrators. In planning programs and evaluating alternative curriculum models, close collaboration and consultation to be obtained from state and national organizations and their local affiliates, including: the Association of University Programs in Health Administration, the American College of Hospital Administrators, the American College of Nursing Home Administrators, the American Psychiatric Association, the Association on Mental Health Administrators, the Texas Hospital Association, the Board for Texas State Hospitals and Special Schools, and the Texas Nursing Home Association.

Survey of Continuing Educational Needs of Hospital Administrators and Their Top Supervisory Personnel

The first major task of the Center was to conduct a survey to assess the current educational requirements of health care administrators and their top supervisory personnel (middle-management) located in a six state region of the Southwestern United States, the major service area of the Center for Professional Development in Health Administration.

The survey was divided into two major categories. One category pertained to Hospital Administrators only,[8] and the other category dealt with all other top supervisory personnel in the hospital.[9] The Administrator Questionnaires and Top Supervisory Questionnaires were mailed together to 1,102 hospitals. Tables 1 and 2 display the number and percentage of questionnaires returned from the survey.

The questionnaire for the administrators was composed of five parts designed to elicit data on:

1. The most convenient times and places to schedule continuing educational programs, with particular reference to home study and recently developed "teleconferencing" teaching technology.

2. Curriculum subjects drawn heavily from the topic recommended currently by the accreditation body of the Association of University Programs in Health Administration.

3. Questions of cost and granting degree credit for such courses.

4. Topics of current interest for short-term programs.

5. Personnel data on the responding administrators and their facilities for cross-tabulating purposes (Appendix 1 - questionnaire).

The questionnaire for top supervisory personnel consisted of eight major areas:

1. Demographic characteristics of the respondents.

2. Respondents' long range career objectives.

3. Interest in obtaining a graduate degree in health care administration.

4. Scheduling of continuing education programs.

5. Interest in home study programs.

6. Interest in teleconferencing.

7. Scheduling of degree programs, with cost considerations.

8. Curriculum content for continuing education programs (Appendix 2 - questionnaire).

Three areas of the survey results of particular interest to the Center staff were 1.) the respondents' interest in obtaining a graduate degree in health care administration, 2.) home study programs, and 3.) teleconferencing programs. Although most hospital administrators had graduate degrees in health care administration, there were many associate and assistant administrators and department heads who did not have the credential and indicated a strong interest in obtaining the degree. Respondents rated home study as the most preferred method of participation in educational programs. Further, the respondents indicated that educational programs combining teleconferencing with home study would be most convenient for them, taking into consideration their present positions in hospital settings and the time constraints involved.

Following an intensive analysis of the results of the survey and further reflection on the original objectives of the Kellogg Foundation grant, the Center began consideration of a master's degree program designed to

TABLE 1
ADMINISTRATORS

The number and percent of administrator survey questionnaires mailed and returned in the Southwest service region.

QUESTIONNAIRES

	Mailed		Returned		Percent of Total Received	Percent of Total Mailed
	N	% of Total	N	% of State Response		
STATES						
Anonymous	0	0%	5	__%	1.3%	.5%
Arizona	76	7	15	20	4.0	1.4
Arkansas	95	9	24	25	6.4	2.2
Louisiana	154	14	27	18	7.2	2.5
New Mexico	45	4	7	16	1.9	.7
Oklahoma	145	14	33	23	8.8	3.1
Texas	555	52	264	48	70.4	24.7
Total	1070	100%	375	35%	100.0%	35 %

TABLE 2
TOP SUPERVISORY PERSONNEL

Number and percent of Department Head Questionnaires mailed and returned according to selected states.

QUESTIONNAIRES

	Mailed		Returned		
	N	Percent	N	Percent of Total	Percent of State Return
STATES					
Anonymous			4	.02%	
Arizona	2,138	13%	31	.19%	1.45%
Arkansas	1.655	10%	54	.33%	3.26%
Louisiana	2,424	15%	103	.63%	4.25%
New Mexico	620	4%	25	.15%	4.03%
Oklahoma	2,126	13%	157	.96%	7.38%
Texas	7,369	45%	729	4.47%	9.89%
Total	16,332	100%	1,103	6.75%	

meet the need of practicing administrators and their top supervisory personnel. The primary reason for considering the non-traditional, practice-based graduate degree program in health care administration was to provide a degree program to individuals who, for various reasons, could not leave their administrative positions to obtain such degree work.

Administrative Considerations in the Development of the Non-traditional Master's Degree Program in Health Care Administration

The Center staff, together with the faculty of the on-campus master's degree program in health administration and the Graduate School Dean, began deliberations in the Fall of 1977 concerning the structure of the proposed new non-traditional graduate degree program.

Foremost in the thought of those involved in the development of the degree program was the establishment of its credibility with the appropriate University administrative bodies responsible for evaluating academic programs. The Center emphasized that the non-traditional graduate program was being designed and would be maintained under several stringent evaluation requirements.

First, the program was being developed with detailed consideration of the requirements as set forth by the Accrediting Commission of the Southern Association of Colleges and Schools which relate to off-campus educational activities. The Center stressed that before the degree program became operational it would be evaluated by the Commission.

Second, the Center would seek accreditation of the external degree program by the Accrediting Commission for Graduate Education in Health Services Administration which is recognized by the Office of Education and the Council on Post Secondary Accreditation. Presently, the Accrediting Commission has not developed specific standards for external degree programs, but it has begun deliberations concerning such accreditation. The Center intends to become the first accredited non-traditional graduate program in the Southwest. Center staff pointed out to the University administrative bodies that once this accreditation has been achieved important funding opportunities from both public and private sectors will be generated. The Center anticipates that these future funding opportunities will be used more for qualitative program enrichment than for growth and expansion.

The Center, in addition to stating that the above evaluation requirements provide important external reviews, emphasized its own inherent responsibility and that of the Department of Health Care Administration to view the external master's degree program as an experimental model to be subjected to thorough internal research and evaluation. It was pointed out that the opportunity to develop and evaluate innovative educational programs is one of the primary objectives of the Center, and it was the high potential for achieving this objective at Trinity University that generated support from the Kellogg Foundation at the outset.

In presentations to the Universtiy administrative bodies, the Center explained that the external master's degree program will provide services for a neglected population of health care professionals who have no access to on-campus full time programs because of their work situations. It was stressed that the non-traditional master's degree program courses, while innovative, contained much the same material as that already approved and currently being taught at the graduate level in the on-campus program, with the primary difference between the two programs being the mode of delivery of instruction.

Regarding student-instructor contact hours, an item of concern, the Center stressed that modern communication technology provides the means to offer the program under instructional and supervised teaching similar to on-campus course conditions. Technology such as teleconferencing, and its ability to offer two-way communication between the instructor and students in different locations, was viewed as a suitable supplement to on-campus classroom instruction, with some modifications.

While the curriculum contents of the external master's degree program are similar to the on-campus program, the Center stressed that the external degree courses include greater emphasis on relating concepts and principles to practice problems utilizing the richness of the students' health care setting and their competence. Thus, another quality control measure of the program allows competency testing of classroom concepts in an actual practice setting, a positive improvement over traditional programs where this integration of principle and practice is difficult to achieve at this high level.

In the Spring of 1977 the concept of and principles underlying the non-traditional practice-based master's degree program in health care administration were approved by the appropriate University administrative bodies.

Structure of the External Master's Degree Program

Although the concept and principles underlying the external degree program were approved by the University administrative bodies in the Spring of 1977, the structure of the program was not approved until the Spring of 1978.

The program, which is four years in length, requires eight generic courses in health care administration followed by three courses in specialty option plans. These plans offer specialized coursework in the area of hospital administration and in other areas (such as mental health administration, long-term care administration, and ambulatory care) presently being planned. Subsequent to the completion of the formal coursework, a comprehensive qualifying examination covering the courses will be given. After successful completion of this examination, four seminars (projects) encompassing major operational problem areas within the enrollee's work environment will be completed. Figure 1 illustrates the course sequence of the external master's degree program.

The graduate courses are six months in length, with two courses offered during each six-month segment. Each segment begins with a two-day intensive on-campus session followed by five months of home study. The home study is supplemented by monthly teleconferencing sessions of 4 hours in length. These teleconferencing sessions are handled through the Darome Connection, Harvard, Illinois, a company specializing in interactive audio systems. The teleconference, or conference call, system links the instructor simultaneously with students located at different facilities or in their individual homes and allows interaction between instructor and students and between the students themselves concerning the monthly home-study assignments.

Program Experience

The external, practice-based master's degree program in health care administration began with a class of 27 in May, 1978. The attrition rate in the first class was high (66%), due to several factors: movement to new positions, inability to secure student tuition funding, and failure to develop a regular study regimen. Additionally, the individuals who started the program had not been in an academic environment for several years; meeting graduate course requirements was most difficult for some of them.

In order to reduce the attrition rate, students now entering the program are advised of its uniqueness and of the necessity to develop disciplined study habits. In January 1979, the students and faculty requested a change in the length of the coursework. Instead of the students spending a full year completing four courses of three semester hours each (for a total of 12 credit hours), the four courses were restructured to be taught in two six-month segments (two courses taught in the first six months, followed by the other two courses taught in the second six months). (Figure 1 shows revised time schedule) Instructional hours, teleconferencing time, and assignment content remained the same.

In May, 1979, a second class of 32 individuals entered the program. Thus far, the attrition rate has been very low (less than 10%) and the students have been doing quite well in the coursework. The attrition rate is expected to remain low with this particular class. It is important that students realize from the beginning the rigor and time demanded of them in the program.

Reflections

The external master's degree program has gotten off to a good start and, based upon student demand and faculty support, the prospects for its continuence look promising. The structure of the program is strong in that it follows closely the curriculum model used by the on-campus master's degree program in health care administration. The on-campus program is fully accredited by the Accrediting Commission on Education for Health Services Administration and is a member of the Association of University Programs in Health Administration.

Teleconferencing (dial-up conferencing) as presently used by the program, is vital to the program's future. Faculty members view teleconferencing as a good means of communicating with students concerning home-study assignments. Difficulty with the system is encountered when attempting to teach graduate courses in statistics and financial management. Teaching methods are being evaluated in these particular courses. Johansen, et. al. in their report Electronic Education: Using Teleconferencing in Post-secondary Organizations[10] identify several prerequisites to implementing teleconferencing which apply directly to the external master's degree program:

1. Openness to trying out new technologies.

2. Demonstrated need for educational services.

FIGURE 1

PROGRAM II GRADUATE COURSE OUTLINE

PROGRAM IIA (First year of Graduate Program):

First six months:

HCAD 382PI	Legal Aspects of Health Services Administration	(3 credit hours)
HCAD 380I	The Health Services System	(3 credit hours)

Second six months:

HCAD 384UI	Health Care Organization and Management	(3 credit hours)
HCAD 388I	Health Care Organization Research	(3 credit hours)

PROGRAM IIB (Second year of Graduate Program):

First six months:

HCAD 389I	Financial Management for Health Administration	(3 credit hours)
HCAD 381SI	Social Aspects of Health Care Administration	(3 credit hours)

Second six months:

HCAD 383I	Health Care Planning	(3 credit hours)
HCAD 381EI	Economic Aspects of Health Care Administration	(3 credit hours)

PROGRAM IIC (Third year of Graduate Program):

First six months:

	Specialty Option Course	(3 credit hours)
	Specialty Option Course	(3 credit hours)

Second six months:

	Specialty Option Course	(3 credit hours)

(Specialty courses will be offered contingent upon sufficient student enrollment)

Acute Care (Hospital) Administration Plan (Any 3 courses of those shown below):

HCAD 382LI	Organizational Behavior and Health Care Administration
HCAD 382MI	Emergency Medical Services Administration
HCAD 384DI	Health Manpower Management
HCAD 386I	Seminar in Health Care Systems and Public Policy
HCAD 391I	Seminar in Contemporary Issues in Health Care Administration

COMPREHENSIVE QUALIFYING EXAMINATION (at the end of the third year or completion of courses listed above)

PROGRAM IID (Fourth year of Graduate Program--Executive Health Care Administration)

First six months:

HCAD 393PI	Seminar in Health Services Planning	(3 credit hours)
HCAD 393RI	Seminar in Allocation of Health Care Resources	(3 credit hours)

Second six months:

HCAD 393CI	Seminar in Quality Control Management of Health Facilities	(3 credit hours)
HCAD 393EI	Seminar in Health Care Program Evaluation	(3 credit hours)

3. Commitment of an effective advocate.

4. Adequate start-up and continuing funding sources.

5. Accessibility of teleconferencing equipment and information.

In considering the above prerequisites, the Center has been most fortunate to have:

1. Trinity University support in its efforts to develop an external degree program to meet the needs of individuals who otherwise would not have the opportunity to obtain the degree.

2. A most supportive faculty of the on-campus program, all of whom also teach in the external program.

3. Kellogg Foundation money to support development of the program.

4. The experience of other institutions such as the University of Texas Health Science Center's Continuing Education Department, the University of Wisconsin's Extension Division in Madison, Wisconsin, and the Darome Connection, Harvard, Illinois, in assuring the success of teleconferencing in the external degree program.

FOOTNOTES

[1] Lorne Parker and Betsy Riccomini, The Status of the Telephone in Education (Madison: University of Wisconsin Extension, 1976).

[2] Lorne Parker and Betsy Riccomini, The Telephone in Education (Madison: University of Wisconsin Extension, 1977).

[3] Ann DeVaney Becker, "Teleconferencing, A Survey and Evaluation," Journal of Communication (Summer 1978).

[4] A. Gilbertson and B. Riccomini, Technical Design for Audio Teleconferencing (Madison: University of Wisconsin Extension, 1975).

[5] Vernon Brazle, Report on Teleconferencing Users (Champaign: University of Illinois at Urbana, 1978).

[6] Center for Professional Development in Health Administration, Proposal to the W.K. Kellogg Foundation (San Antonio: Trinity University, 1976).

[7] Commission on Education for Health Administration, The Report of the Commission on Education for Health Administration, Volume 1 (Ann Arbor: Health Administration Press, 1975).

[8] Ted Sparling and E.G. Jaco, An Analysis of the Perceptions of Hospital Administrators towards Continuing Education (San Antonio: Center for Professional Development in Health Administration, Trinity University, 1980).

[9] Ted Sparling, Survey of Continuing Education Needs of Hospital Department Heads and Top Supervisory Personnel in the Southwestern United States (San Antonio: Center for Professional Development in Health Administration, Trinity University, 1979).

[10] Robert Johansen et. al., Electronic Education: Using Teleconferencing in Postsecondary Organizations (Menlo Park: Institute for the Future, 1978).

APPENDIX 1

CENTER FOR CONTINUING EDUCATION IN HEALTH ADMINISTRATION, TRINITY UNIVERSITY, SAN ANTONIO, TEXAS
SURVEY OF CONTINUING EDUCATION NEEDS OF DEPARTMENT HEADS IN SOUTHWEST REGION

Name (print) ______________________________ Date __________
Title or Position ______________________________
Hospital ____________________ Town ____________ State __________

The Center plans to offer a variety of educational programs for heads of all departments of the hospital in addition to other programs. To assist us in planning these courses we need to know your own personal needs and interests in obtaining such advanced education as per this questionnaire. When completed, please return the form to us via the procedure suggested by your hospital administrator.

1. My long range career objectives are: (check one) ☐ To become a chief executive officer of a hospital; ☐ To remain in my present position; ☐ To move into an administrative position out of the hospital field; ☐ Uncertain. Other (specify) ______________________________

2. Are you interested in obtaining a graduate, professional degree in health care (hospital) administration at some time in the future
☐ Yes ☐ No ☐ Uncertain

I. SCHEDULING CONTINUING EDUCATION PROGRAMS:
A major effort by the Center at Trinity University will be to offer courses of interest at times that will be as convenient as possible. To help us assess the best times for scheduling our programs, please give us your careful responses to the following:

Circle your rating for each item at the left and add any comment in space at right.

5 Most convenient for me
4 Reasonably convenient
3 Fairly convenient, but may be difficult
2 Inconvenient for me
1 Impossible for me to participate
0 Uncertain: see comment

After rating each item on the left, please add any comments you may have after that item in the space on the right.

(Circle one below for each location)

At Trinity Univ.:	At/Near my Facility:	Program:	Comment:
		Campus Classroom Programs:	
5 4 3 2 1 0	5 4 3 2 1 0	3 1-Day or less programs	________
5 4 3 2 1 0	5 4 3 2 1 0	4 Institute or Workshops, 2 or 3 Days	________
5 4 3 2 1 0	5 4 3 2 1 0	5 Evening Courses, 1 night per week	________
5 4 3 2 1 0	5 4 3 2 1 0	6 Evening courses, 2 nights per week	________
5 4 3 2 1 0	5 4 3 2 1 0	7 Week-end courses	________
5 4 3 2 1 0	5 4 3 2 1 0	8 1-week concentrated sessions	________
5 4 3 2 1 0	5 4 3 2 1 0	9 2-week concentrated sessions	________
5 4 3 2 1 0	5 4 3 2 1 0	10 3-week concentrated sessions	________
5 4 3 2 1 0	5 4 3 2 1 0	11 Above — more than once a year	________
5 4 3 2 1 0	5 4 3 2 1 0	12 Preceptor-teaching sessions (Preceptor — a professionally educated and experienced administrator in a tutorial function)	________

COMMENT:

OTHER PROGRAMS:

We are now in our 9th year with our Health Services Administrators Development (HSAD) program. This involves a 1-week session on our campus followed by an 11 month home study (correspondence) period, then concluded by another 1-week session at Trinity (the 1-week periods can be during vacation times, etc.) How does this program appeal to you?

(Rating:)

5 4 3 2 1 0	13. Home Study (correspondence) course with 1-week on-campus sessions as above ________
5 4 3 2 1 0	14. Home Study courses with two 2½ day sessions (instead of 1-week) on campus ________
5 4 3 2 1 0	15. Home Study courses only (no on-campus sessions) ________

Comment ______________________________

Telephone and "Teleconferencing" programs are other possibilities for off-campus education. "Teleconferencing" involves a 2-way audio-communication system between instructor and audience of enrollees convening at a hospital conference room in health facilities near yours located all over the Southwest region. How does Teleconferencing also appeal to you?

5 4 3 2 1 0	16. Telephone set-up only, with direct long distance calls to instructor ________
5 4 3 2 1 0	17. Teleconferencing set-up only, as above ________
5 4 3 2 1 0	18. Teleconferencing combined with Home Study above ________

19. What day(s) of the week ____________ and hours of the day ____________ would be the most convenient for you personally for Teleconferencing sessions?
Comment, please ______________________________

20 If a degree program were offered on a schedule reasonably convenient to you, as indicated in Part I, how would this appeal to you personally? (check) ☐ Outstandingly, would definitely enroll. ☐ Very much, very likely enroll ☐ Somewhat, may or may not enroll; ☐ None at all, not enroll. ☐ Uncertain. Comment, please ____________________

21 Would your Facility be able to support tuition, travel and related costs for your own participation in any of the above programs, if totalled less than $500? (check one) ☐ Fully ☐ Partly ☐ None ☐ Uncertain.

22 If over $500? ☐ Fully ☐ Partly ☐ None ☐ Uncertain.

23 If funds were available to support all or most of the costs involved for such courses, would this make your own participation more likely: (check one) ☐ Yes ☐ No Why? ____________________

____

II. CURRICULUM CONTENT FOR CONTINUING EDUCATION PROGRAMS:

If continuing education programs were made available to you according to the convenient time-schedules you indicated in Part I, how interested would you be in enrolling in any of the following programs? Please circle the number of your preference for EACH item below, and also comment on any item you feel needs further clarification.

After rating each topic, please comment on that item, its wording or meaning, and anything else you wish to express in the space after each topic on the right.

I would personally be:

5 Strongly interested; definitely enroll
4 Moderately interested; likely enroll
3 Mildly interested; may may not enroll
2 Not interested; not enroll
1 Uncertain; see my comment

	Topic:	**Comment:**
5 4 3 2 1	24 Basic Principles of Management	____
5 4 3 2 1	25 Management Principles Applied to the Hospital	____
5 4 3 2 1	26 Personnel Management Principles	____
5 4 3 2 1	27 Basic Accounting Principles & Methods	____
5 4 3 2 1	28 Budgeting Methods & Applications	____
5 4 3 2 1	29 Financial Management Basic Principles	____
5 4 3 2 1	30 Advanced Financial Management	____
5 4 3 2 1	31 Hospital Public Relations	____
5 4 3 2 1	32 Managing People: General Principles	____
5 4 3 2 1	33 Managing Work: General Principles	____
5 4 3 2 1	34 Effective Communications	____
5 4 3 2 1	35 Managing Resources	____
5 4 3 2 1	36 Hospital Departmental Organization	____
5 4 3 2 1	37 Advanced Hospital Management Concepts & Skills	____
5 4 3 2 1	38 Legal Aspects of Hospital Operations	____
5 4 3 2 1	39 Problems & Issues Facing the American Health Care System	____
5 4 3 2 1	40 Hospital Planning Principles	____
5 4 3 2 1	41 Hospital Design & Construction	____
5 4 3 2 1	42 Management Engineering	____
5 4 3 2 1	43 Statistical Methods for Management	____
5 4 3 2 1	44 Hospital Labor Relations	____
5 4 3 2 1	45 Interpersonal Skills in Management	____
5 4 3 2 1	46 Medical Care Organization	____
5 4 3 2 1	47 Economics of Health Care	____
5 4 3 2 1	48 Political Aspects of Health Care	____
5 4 3 2 1	49 Social Aspects of Health Care	____
5 4 3 2 1	50 Program Evaluation & Decision Analysis	____
5 4 3 2 1	51 Hospital, Community & Modern Society	____
5 4 3 2 1	52 Social & Organizational Change	____
5 4 3 2 1	53 Management Development for Hospital Supervisors	____
5 4 3 2 1	54 Health Services Organization & Management	____
5 4 3 2 1	55 Hospital Governing Board Relations	____
5 4 3 2 1	56 Advanced Hospital Management	____
5 4 3 2 1	57 Advanced Principles of Accounting	____
5 4 3 2 1	58 Critical Issues in Financial Management	____
5 4 3 2 1	59 Operations Theory & Principles	____

60 Please list below any other courses you personally would want offered. (Be as precise as possible) ____________________

____

____

____

____

____

____

____

____

____

PERSONNEL DATA:

61 Age (check one) ☐ under 25, ☐ 25-34, ☐ 35-44, ☐ 45-54, ☐ 55-64, ☐ 65 or older

62 ☐ Male ☐ Female 63 No. of Years in present position ________

Education (Check ALL that apply) ☐ High School ☐ Community or Jr. College ☐ Baccalaureate degree (B.A.; B.S.)

☐ Nursing degree or diploma ☐ Other education or training (specify) ____________________

65 No. beds (excluding bassinets) of your hospital ____________________

If you want more data on our HSAD program, please check ☐ On Teleconferencing ☐

OUR DEEPEST THANKS FOR YOUR HELP!

APPENDIX 2

CENTER FOR CONTINUING EDUCATION IN HEALTH ADMINISTRATION, TRINITY UNIVERSITY, SAN ANTONIO, TX 78284
SURVEY OF CONTINUING EDUCATION NEEDS OF HEALTH ADMINISTRATORS IN SOUTHWEST REGION

Name (optional) ____________________ Date ____________
Title or Position ____________________
Hospital ____________________ Town ____________ State ____________

I. SCHEDULING CONTINUING EDUCATION PROGRAMS:

Continuing education programs for hospital and health administrators are offered at various times and by differing methods. Being very busy people, health administrators wanting such education have not always been able to take such courses at times convenient to their own schedules. A major effort by the Center at Trinity University will be to offer courses of interest to administrators at times that will be as convenient as possible. To help us assess the best times for scheduling our programs, please give us your most careful responses to the following:

Circle your rating for each item at the left and add any comment in space at right.

5 Most convenient for me
4 Reasonably convenient
3 Fairly convenient, but may be difficult
2 Inconvenient for me
1 Impossible for me to participate
0 Uncertain; see comment

After rating each item on the left, please add any comments you may have after that item in the space on the right.

(Circle one below for each location)

At Trinity Univ.:	At/Near my Facility:	Program:	Comment:
		Campus Classroom Programs:	
5 4 3 2 1 0	5 4 3 2 1 0	1. 1-Day or less programs	____________
5 4 3 2 1 0	5 4 3 2 1 0	2. Institute or Workshops, 2 or 3 Days	____________
5 4 3 2 1 0	5 4 3 2 1 0	3. Evening Courses, 1 night per week	____________
5 4 3 2 1 0	5 4 3 2 1 0	4. Evening courses, 2 nights per week	____________
5 4 3 2 1 0	5 4 3 2 1 0	5. Week-end courses	____________
5 4 3 2 1 0	5 4 3 2 1 0	6. 1-week concentrated sessions	____________
5 4 3 2 1 0	5 4 3 2 1 0	7. 2-week concentrated sessions	____________
5 4 3 2 1 0	5 4 3 2 1 0	8. 3-week concentrated sessions	____________
5 4 3 2 1 0	5 4 3 2 1 0	9. Above — more than once a year	____________
5 4 3 2 1 0	5 4 3 2 1 0	10. Preceptor-teaching sessions (Preceptor — a professionally educated and experienced administrator in a tutorial function)	____________

OTHER PROGRAMS:

We are now in our 9th year with our Health Services Administrators Development (HSAD) program. This involves a 1-week session on our campus, followed by an 11-month home study (correspondence) period, then concluded by another 1-week session at Trinity. How does this program appeal to you?

(Rating — Circle one below)		**Comment:**
5 4 3 2 1 0	11. Home Study (correspondence) course with 1-week on-campus sessions as above	____________
5 4 3 2 1 0	12. Home Study courses with **two** 2½ day sessions (instead of 1-week) on campus	____________
5 4 3 2 1 0	13. Home study courses **only** (no on-campus sessions)	____________

Comment: ____________________

Telephone and "Teleconferencing" programs are other possibilities for off-campus education. "Teleconferencing" involves a 2-way audio-communication system between instructor and audience of enrollees convening at a hospital conference room in health facilities near yours located all over the Southwest region. How does Teleconferencing also appeal to you?

5 4 3 2 1 0	14. Telephone set-up **only**, with direct long distance calls to instructor	____________
5 4 3 2 1 0	15. Teleconferencing set-up **only**, as above	____________
5 4 3 2 1 0	16. Teleconferencing **combined** with Home Study above	____________
5 4 3 2 1 0	17. "Refresher" or short review courses	____________

Comment, please: ____________________

II. CURRICULUM CONTENT FOR CONTINUING EDUCATION PROGRAMS:

A. Accredited Curriculum for Master's Degree in Health Care Administration:
The topics below include the curriculum recommended currently by the accreditation body for the Master's Degree in Health Care Administration. Some of you having this degree may not have had some of these courses offered then. Some of you may want refresher or review courses on certain topics. Still others may want to attain this Degree or equivalent via some convenient time-schedule you have indicated in Part I herein. (Note that many of these are not traditional continuing education courses.)

If continuing education programs were made available to you according to the convenient time-schedules you indicated in Part I, how interested would you be in enrolling in any of the following programs? Please circle the number of your preference for EACH item below, and also comment on any item you feel needs further clarification:

I would personally be:
5 Strongly interested; definitely enroll
4 Moderately interested; likely enroll
3 Mildly interested; may may not enroll
2 Not interested; not enroll
1 Uncertain; see my comment

After rating each topic, please comment on that item, and anything else you wish to express in the space after each topic on the right.

Topic: **Comment:**

SEQUENCE A: ADMINISTRATIVE THEORY, CONCEPTS AND SKILLS:

5 4 3 2 1 | 18. Theory & Practice of Administration — Basic Course ________
5 4 3 2 1 | 19. Advanced Practice & Principles of Administration ________
5 4 3 2 1 | 20. Critical Issues & Problems in Administration ________
5 4 3 2 1 | 21. Organization Theory & Change ________
5 4 3 2 1 | 22. Personnel Management: Principles & Applications ________
5 4 3 2 1 | 23. Personnel Management: Critical Issues ________
5 4 3 2 1 | 24. Labor Relations ________

SEQUENCE B: SOCIAL & BEHAVIORAL SCIENCES:

5 4 3 2 1 | 25. The American Economy ________
5 4 3 2 1 | 26. The American Political System
27. The American Society ________
5 4 3 2 1 | 28. Economics of Health Care ________
5 4 3 2 1 | 29. Political Aspects of Health Care ________
5 4 3 2 1 | 30. Social Aspects of Health Care ________
5 4 3 2 1 | 31. Legal Aspects of Health Care ________
5 4 3 2 1 | 32. Health Care Systems & Public Policy ________

SEQUENCE C: QUANTITATIVE METHODS:

5 4 3 2 1 | 33. Quantitative (Statistical) Analysis for Administration ________
5 4 3 2 1 | 34. Systems & Operations Analysis ________

SEQUENCE D: FINANCE:

5 4 3 2 1 | 35. Basic and Advanced Principles of Accounting ________
5 4 3 2 1 | 36. Financial Analysis for Decision-Making ________
5 4 3 2 1 | 37. Budgeting & Financial Management for Health Administration ________
5 4 3 2 1 | 38. Critical Issues in Financial Management ________

SEQUENCE E: HOSPITAL AND HEALTH CARE ADMINISTRATION:

5 4 3 2 1 | 39. Health Services Organization & Management: Functions and Roles ________
5 4 3 2 1 | 40. Health Services Organization & Management: Critical Issues ________
5 4 3 2 1 | 41. Program Evaluation & Decision Analysis ________
5 4 3 2 1 | 42. Advanced Hospital Management: Management by Objectives ________
5 4 3 2 1 | 43. Advanced Hospital Management: Planning, Modernizing & Construction of Hospitals ________
5 4 3 2 1 | 44. Problems and Issues Facing the American Health Care System ________
5 4 3 2 1 | 45. Public & Community Relations ________
5 4 3 2 1 | 46. Advanced Hospital Management: Other (Specify): ________

CURRICULUM CONTENT Continued: **Comment:**

SEQUENCE F: PLANNING:

5 4 3 2 1 | 47. Health Care Planning: Basic Principles ____________
5 4 3 2 1 | 48. Health Care Planning: Critical Issues ____________

SEQUENCE G: MEDICAL CARE:

5 4 3 2 1 | 49. Environmental & Personal Health Services ____________
5 4 3 2 1 | 50. Quality Assessment of Health Services and Social Accountability ____________
5 4 3 2 1 | 51. Medical Care Organization ____________

SEQUENCE H: MISCELLANEOUS AREAS:

5 4 3 2 1 | 52. Fund Raising ____________
5 4 3 2 1 | 53. Management Engineering ____________
5 4 3 2 1 | 54. Social & Organizational Change ____________
5 4 3 2 1 | 55. Medical Sociology ____________
5 4 3 2 1 | 56. Hospital, Community and Modern Society ____________
5 4 3 2 1 | 57. Governmental Regulations of Health Services & Facilities: Problems & Issues ____________

B. Alternative Academic Programs:

58. **If you now have the Master's Degree in Health Care or Hospital Administration, check ☐ and kindly move to Item 63 below. Those who do not, please continue.**

59. Since many of you have considerable experience in hospital management and may also possess degrees **other** than the Master's (Professional) Degree in Health Care Administration, would other kinds of coursework interest you more than the preceding curricular topics in A. above, whether or not it leads to a professional degree in health administration? (check) ☐ Yes ☐ No. Why? ____________

60. If a degree program were offered on a schedule reasonably convenient to you, as indicated in Part I, how would this appeal to you personally? (check) ☐ Outstandingly, would definitely enroll; ☐ Very much, very likely enroll; ☐ Somewhat, may or may not enroll; ☐ None at all, not enroll; ☐ Uncertain. Comment, please ____________

61. The Center is considering offering **non-traditional** programs that may lead to a degree in health care administration via some means that will insure quality while also offering such coursework on a schedule feasible to full-time employed administrators of differing levels. What specific courses would you want **added** to the preceding curriculum in A. above (list): ____________

Why? ____________

62. What specific courses would you **delete** from the above curriculum? (list) ____________

Why? ____________

63. Of special interest to the Center is your feeling about having access to more systematic and "building-block" types of continuing education programs — courses that would progressively advance from basic, elementary knowledge and skills to more advanced levels on a systematic and programmed basis along specific knowledge "tracks" offered in self-contained modules. Would this approach appeal to you? (check one) ☐ Very much ☐ Somewhat ☐ Mildly ☐ Not at all ☐ Uncertain. Comment ____________

64. Would granting of "credit" or recognition of some kind for course work be a major factor in your taking any of these courses? ☐ Yes ☐ No Why? ____________

65. Would your Facility be able to support tuition, travel and related costs for your own participation in any of the above programs, if totalled less than $500? (check one): ☐ Fully ☐ Partly ☐ None ☐ Uncertain.
If over $500? ☐ Fully ☐ Partly ☐ None ☐ Uncertain.

66. If funds were available to support all or most of the costs involved for such courses, would this make your own participation more likely? (check one) ☐ Yes ☐ No Why? ____________

III. CURRENT TOPICS FOR SHORT-TERM PROGRAMS (Seminars, Workshops, Institutes, etc.):

Keeping current on new developments in the health care field is a major responsibility of health administrators. Most of these short-term programs are currently offered by hospital and related professional associations. The Center plans to offer these kinds of programs in a different manner to augment these other programs rather than to compete with them. To help us provide such programs we need your concerns and interests in these topics. Please list below what you personally regard as the **three (3) most significant** issues or problems in the health care field today, and preferably in the order of their importance:

67. (1) ____

(2) ____

(3) ____

68. Since these short-term programs will vary as problems and issues change in the future, we wish to plan such programs that meet your own needs and concerns. Would you be willing to be polled routinely by our Center from time to time on topics of current interest that you personally would want offered? (check) ☐ Yes ☐ No

69. No survey of this type can fully touch all the bases of administrator's interest in continuing education needs and concerns. Please help us at the Center by indicating any additional comments, suggestions and recommendations you care to offer concerning education of health care executives with experience comparable to your own: **(Now's your chance!)**

PERSONNEL DATA:

70. Age: (check one) ☐ Under 25; ☐ 25-34; ☐ 35-44; ☐ 45-54; ☐ 55-64; ☐ 65 or older

71. ☐ Male ☐ Female 72. No. of years in present position ____________ 73. In health administration total ____________

Education: (Check ALL that apply) ☐ High school ☐ Community or Jr. college ☐ Baccalaureate degree (B.A.; B.S.)

☐ Nursing degree or diploma ☐ Master's degree in (specify) ____________ ☐ Doctor's degree in (specify) ____________

Other education or training (specify ____

75. Membership Status in ACHA ________________________ 76. In AAMA ________________________

77. No. active medical staff ________ 78. No. department heads ________ 79. No. of Governing Board members ________

80. No. beds (excl. bassinets) ____________

(Please leave blank:) (81.) ________ (82.) ________ (83.) ________ (84.) ________ (85.) ________

86. ☐ Please send me a copy of the final results (Check if wanted).

OUR DEEPEST THANKS FOR YOUR HELP! PLEASE RETURN IN THE ENCLOSED POSTAGE-PAID ENVELOPE

STRATEGIES FOR THE DEVELOPMENT OF A STATEWIDE EDUCATIONAL TELECONFERENCE SYSTEM: A MONTANA CASE STUDY

Franz A. Nowotny
Dean
School of Extended Studies and Community Service
Eastern Montana College, Billings, Montana

Conditions underlying the new impetus for telecommunications

While there is a general belief that the oil companies had a hand in generating the oil crisis and the University of Wisconsin-Extension in pioneering modern teleconferencing, there is little doubt that these two unreleated phenomena, together, have had far reaching impact on future delivery systems utilizing interactive media.

On the one hand, the technology is there and with it abundant empirical evidence in the literature, that learning outcomes using interactive media are equal to those of face to face instruction. On the other hand, soaring energy costs have made transportation and with it face to face instruction at distant locations uneconomical and conversely distant learning telecommunication systems cost-effective and economically superior.

Add to this the existence and growth of the lifelong learning force, estimated at over 50 million persons, participating in continuing education activities and the demand for a "blended life plan," as suggested by K. Patricia Cross,[1] in which the functions of schooling, work, and leisure in our society will be less departmentalized agewise, and this movement toward greater reliance on alternative telecommunications systems for educational and instructional purposes receives new impetus.

Additionally, student enrollments in higher education of traditional students, ages 18-22 years old may decline nationally at about ten percent as predicted by Clark Kerr[2] during the 1980's. This, together with the lifelong learning movement, will cause significant changes in the composition and types of students participating in higher education. As a result, the students will see increased interest by colleges and universities in exploring new ways to reach the non-traditional students.

An array of seemingly unrelated factors, such as proven and newly developed technology, the energy crisis, the demographics of higher education and the lifelong learning movement, have combined to open new opportunities to colleges and universities to enter the telecommunication era with a minimum of risk and a large potential for meeting the educational obligations to their students in their service regions.

Strategies for the implementation of a statewide telecommunication system in a large, low-population density state

Phase I Low Volume - Low Risk

The strategy in developing a statewide telecommunication system is to proceed in a manner that provides maximum benefits while minimizing risks.

With a mission to provide educational services to the citizens of Montana, particularly to those living in the eastern portions of the state and with a mandate to provide these services on a self-supporting basis, without state subvention, a new approach was required to provide access to education to the people in remote areas of the state.

Montana, like other states in the Midwest, West, and the Rocky Mountain region, is a land of sparse population and vast geographical distances. According to the 1970 Census, 46 percent of the population of Montana was rural, with a population density of five persons per square mile.

The state has neither the resources nor the will to establish branches in rural areas, nor are individuals able to travel 200 or 300 miles on a daily basis to attend classes or workshops on a college or university campus. Additionally, the cost of bringing instructors to small isolated communities with few people of diverse educational needs, is made more difficult in the face of rising transportation costs.

The basic management decision that needed to be made was how to provide Montanans with quality education programs in an effective and cost-efficient manner, given the constraints indicated previously.

After extensively researching solutions to this issue, it was determined that a teleconferencing system would be a viable solution. The system has all the ingredients necessary for a case like ours and could be emulated by colleges and universities in other states.

The key factors in the selection of the telephone conferencing system were the relative low cost of the system operation, the great flexibility of the system use, the minimal capital requirements to start the system, the feasibility to expand, modify and adapt the system.

Using this interactive media, students and faculty can be miles apart; programs can originate from anywhere providing easy access to distant educational resources. Thus, it is an excellent vehicle to achieve the goals of the outreach mission.

In our specific case, the objectives to be accomplished through the network include the following:

1. provide non-credit skill training and enrichment courses for professionals/para-professionals and the general public;
2. provide credit course opportunities so that participants can stay in their home towns while going to school; and
3. provide low-cost teleconferencing opportunities for administrative uses by the various units of the University System, and others who wish to use the system.

Phase I is comprised of the development of the teleconferencing network using regular two wire Mountain Bell lines for transmission, and Darome station equipment for the learning centers. The Meet-Me-Bridge in the control center is the key to this system.

The strategic advantages of implementing Phase I is that the introduction of the network provides great flexibility for experimentation, testing, program exploration and evaluation. The initial capital outlays, the fixed costs, are reasonable and involve purchase of the station equipment, the Meet-Me-Bridge, and contractual personnel costs. The variable costs, that change with the use of the network are telephone line charges and bridge charges. The advantage of using this approach is that there is no immediate pressure to produce a great volume of programs to absorb the rather substantial monthly charges that need to be recovered under a dedicated network.

This is a definite advantage since it allows for a gradual development of the skills of the faculty, allows for the careful structuring of programs so that they can become models for others to follow. Additionally, it allows for intensive testing of the network use in terms of user satisfaction, effectiveness of learning outcomes to provide documentation for our own records and for the Montana University System.

The Meet-Me-Bridge has the capacity to tie together twenty sites/locations if one program or teleconference is taking place. The bridge is programmed to also allow the simultaneous offering of up to four educational programs with each reaching five separate locations or other combinations. This flexibility is very desirable in Phase I.

Phase II High Volume - Low Cost

Phase II builds on the experiences gained during the Phase I operation. In this phase, a dedicated four wire system called the Montana Educational Channel interconnects all the learning centers with the Control Center.

Eastern Montana College already operates learning centers in Colstrip, Plentywood, Hardin, Lewistown, Harlowton, Roundup, Baker, Miles City, Glendive, Red Lodge, and Great Falls. The total number of learning centers in operation by the Fall of 1980 will be 25 to 30 throughout the State of Montana with heavier concentration in the eastern part. Plans call for the establishment of 50 centers at the completion of the network in 1982.

The great number of non-credit and credit programs offered in this phase make it economically feasible to recover the additional fixed costs incurred in the leasing of the dedicated channel. Wherever possible, Telpak mileage is being used to reduce the costs of the channel. Unit fixed costs decline dramatically in this phase making the cost of contracted personnel, line and bridge charges minimal.

The use of the Meet-Me-Bridge complements the system in that it is used primarily for administrative and general teleconferencing and to tie in communities not located on the Montana Educational Channel for sporadic or one time programming.

In addition, the Bridge serves as an interconnect with the Montana Educational

Channel so that its twenty ports can augment the capacity of the Channel. Outside consultants and groups located in other states can also be interconnected to the Channel via the Bridge.

Internalization and Organizational Management Decisions

To internalize and institutionalize a system of distant learning, a number of important steps have to be taken.

1. An advocacy team has to be developed internally to support and explore the feasibility of developing a distant learning network.
2. Feasibility research has to be undertaken analyzing needs of distant learners, availability of types and extent of systems already in existence.
3. Market research must be done to assess program needs in the various communities and by various constituencies.
4. Technical assistance must be solicited from experts and their organizations already active in distant learning networks.
5. Cost/benefit studies should be undertaken exploring the feasibility of program implementation within an established time frame and as in the case of the Montana network, on a self-supporting basis.

In the case discussed here, the University of Wisconsin-Extension teleconferencing network served as the prototype for program emulation once the decision had been reached that such a type of distant learning network, using telephone links as the interactive media, would be the route to take. Technical assistance was obtained from the University of Wisconsin in this initial critical management decision making period. Technical support was also sought later in the implementation phases.

The network approach needed to be significantly different because the system had to be self-supporting, based on fees and revenue generated. The approach used in the Montana case may serve as a model for similar types of organizations, colleges, or universities that are not land-grant supported institutions.

Cost studies are critical in such a case and the Phase I followed by Phase II approach is a viable approach to introduce such a network.

Programs, Outlook, Rewards

Programs in operation during Phase I included credit courses in education and liberal arts. A mathematics course, for example, was taught at the Northern Cheyenne Indian Reservation. Some other examples of courses offered include a course on depression for mental health personnel taught by staff from the University of Pennsylvania, courses for staff from the Montana School for the Deaf and Blind taught by the EMC faculty of the College's Institute for Habilitative Services, workshops on learning environment for residents of the Fort Belknap Indian Reservation, a credit course Introduction to Music Therapy taught by our faculty to faculty peers and students at the University of Montana and Montana State University, a course on Women and the Frontier Experience, and others like this.

Additionally, guest lecturers were introduced via the network to complement on-campus instruction. The system is also used for statewide meetings and teleconferences for informational and administrative purposes.

The rewards of network implementation are substantial and lead to win-win situations for the program participants, the educational institutions and the state.

In a rural state like Montana, the people who participate gain, since the availability of this network provides more equal access to education and information. It allows for fuller access to information data, to data creation, data use and control over knowledge in terms of relevant rural issues.[3]

The college or university gains since it can carry out its community service and educational goals in a cost-effective, self-supporting way. It can, through the use of an interactive telephone network, overcome obstacles of space and time and put together cohesive, quality learning programs of a credit and a non-credit type.

The state benefits from the resulting increase in educational programs available to its citizens, through reduction of program duplication and cooperation of university units, a trait applauded by many in a period of steady state in higher education.

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ITFS: MEETING CURRENT AND FUTURE EDUCATIONAL NEEDS IN NORTHEASTERN CALIFORNIA

Margaret A. Laughlin
Assistant Professor of Education
University of Wisconsin-Green Bay

The challenge of meeting the diverse educational needs of the residents of Northeastern California is formidible. In an attempt to meet these needs, California State University, Chico, (CSU, Chico) initiated the offering of regular university courses via Instructional Television Fixed Service (ITFS). Initiated during the Spring semester, 1975, to date 99 courses in 28 separate disciplines, including the 20 courses offered during the current Spring semester, have been available for student learning. Over 600 students have availed themselves to these educational offerings. Some students have enrolled in more than one course offered through this medium of instruction. Some courses attracted no enrollments and were cancelled.

Some years earlier, in May 1962, the United States Congress recognized the educational potential of television by amending the Communications Act of 1934 with Public Law 87-447 -- "Grants for Educational Television Broadcasting Facilities."[1] It is important to note, however, that in subsequent Presidential proclamations and legislative activities by both Congress and state legislative bodies, the single adjective "broadcasting" rather than the adjective "educational" received most of the attention and focus.

The Role of the Federal Communications Commission

The Federal Communications Commission (FCC) has protected, however, the intent of Congress by emphasizing the adjective "educational" in establishing its various broadcasting regulations. When implementing Congressional actions on July 30, 1963, the FCC established initially 31 low power channels in the 2,500-2,690 mega Hertz frequency band and labeled this spectrum "Instructional Television Fixed Service," now referred to as the "ITFS band," to provide multi-channel availability.[2] It has the technical facilities for distributing television lessons by wireless relay from a production studio to participating school buildings or systems, and also for interconnecting open broadcast and closed circuit systems.[3] By regulation, ITFS is empowered to provide both two way video and audio communication. This allows an instructor to effectively instruct and interact with geographically remote students. Digital and analog transmissions are also possible over ITFS.

Transmissions are limited primarily to line-of-sight range up to approximately 20 miles. The transmissions are usually highly directional which makes these frequencies unsuitable for general broadcasting. Translators are needed to boost signals into outlying areas for programming. ITFS does not replace regular UHF/VHF channels but makes instructional programming opportunities available in areas without educational TV stations.[4]

Some eight years later, June 1971, the FCC on a four to three vote, reduced the number of ITFS channels to 28. These channels were reserved exclusively for non-profit educational processes. This FCC action made it possible for educational institutions at all levels to provide low cost distribution of most types of educational expertise along with instructional, cultural and other types of related materials.[5] This flexibility made it possible for a diversified use of ITFS as a medium of instruction. ITFS is privacy protected, usually closed circuit and requires special adapted receivers.

It has grown from 6 operational systems in 1965 to 186 operational systems as of mid-1976, with several requests for licenses pending.[6] This expansion of ITFS systems has encompassed all educational levels from elementary and secondary school systems through the university level and includes some use by non-profit associations.

According to the FCC, licenses as of May 1977 are divided among the following categories of users:

TABLE I[7]

Public Schools	52%
Private Schools	10%
Graduate Schools	33%
Medicine	5%
TOTAL	100%

Background Data on California State University, Chico

Founded in 1887 as a state normal school for training teachers, CSU, Chico, currently enrolls approximately 13,000 students at both the undergraduate and graduate levels. Students may enroll in a wide variety of classes ranging from agricultural to zoology. The university offers professional programs in business, education and nursing.

As one of 19 individual campus' in the California State University and College (CSUC) system the CSU, Chico, campus extends throughout a 12 county area in Northeastern California.[8] Geographically the CSU, Chico, service area includes approximately 32,888 square miles or approximately 21% of the state. This area has an estimated 503,000 residents or approximately 4.4% of the state's population based on United States Bureau of Census provisional populations estimates.[9]

Metting the unfilled educational needs of residents in such a large geographic area with a sparse and segmented population, necessitated the development of educational programs and plans. They included offering off-campus courses at selected sites in the service area. At times specific courses have been organized and offered in a direct response to a specific request of groups of individuals throughout the service area.

Several years ago CSU, Chico, initiated an "External Degree Program" whereby students who were qualified, interested, and motivated could earn a Bachelors and/or Masters degree in selected areas of study. While many students took advantage of the "External Degree Program," it was more costly to the students who paid higher tuition fees than regular on-campus students. For the dedicated faculty involved in the program, long hours of weekly driving for the entire semester either alone or in a car pool to reach the off-campus instructional sites took its toll.[10] Usually the instructor received a percentage of the student fees as salary, but at other times teaching in the program was considered as a part of the regular faculty assignment with no additional compensation.

Over the years, a variety of summer session course offerings, both regular and special courses have been offered in different locations of the CSU, Chico, service area. These are but two examples of efforts of CSU, Chico, to provide a high quality of instructional programs throughout its service area. The university has extended its resources to the entire area.

ITFS at CSU, Chico

Installation of ITFS equipment initiated still another way for CSU, Chico, to offer an instructional program to residents in Northeastern California, where centers of population are scattered.

Students receiving instruction via ITFS come to one of eight Regional Learning Centers, (RLC's). The northern most RLC is approximately 144 miles away in Weed, at the base of Mt. Shasta, with the transmitter-receiver located at the College of the Siskiyous. The southern most RLC is approximately 45 miles away and located at Beale Air Force Base, just east of the city of Marysville. Other RLC's are located in a health care center (Colusa), one elementary school (Red Bluff), one high school (Anderson), two other community colleges (Marysville and Redding), and a county office of education (Redding), an intermediate educational agency. By placing transmitter-receivers at community colleges in the service area it was thought that community college students might view some of the courses for their own interest and self-growth, or for regular upper division academic credit applicable to their degrees. Except for an occasional viewer and for a variety of reasons, apparently, this expectation has not materialized to any large extent.

In the early 1970's CSU, Chico, built a $8.5 million Learning Activities Resource Center which incorporates and houses traditional library resources, mixed media services, and computers in one facility. Located in this new educational facility is the specially designed and equipped ITFS classroom complete with four cameras operated from an operator-manned control room. Three of the cameras can focus on the instructor and/or students, chalkboard and viewing screen from several different locations in the classroom. One overhead camera placed strategically over the instructor's desk transmits pictures, slides, diagrams and other graphics placed on the instructor's desk. Films, video tapes, filmstrips, demonstrations, etc., can be incorporated in the teaching /learning activities. Through TV monitors located in the ITFS classroom, students in the ITFS classroom can view the same materials as students in the RLC's. Other on-campus classrooms equipped with TV monitors are connected with the ITFS system. Transmissions are in black and white (with image enhancing).

In most instances there are students assembled in the ITFS classroom with unobtrusive microphones placed on student desks and shared by two students so that students in Chico and at the RLC's can interact with each other by pushing a button. The instructor is "wired" with a cordless microphone to facilitate "regular" classroom teaching styles and teacher mobility in the classroom. The use of regular teaching materials is encouraged. Classroom monitors enable the instructor to "see" what is being transmitted throughout the system and, if necessary, to request the technician to focus on an aspect of movement, graphic, student activity, etc. Students present in the RLC's can interact with the instructor and students in the ITFS classroom and/or with students in other RLC's via a telephone system. The talkback system enables the students to become and remain an active part of the on-going learning process.

One course, one semester, had no on-campus students enrolled in the particular course but had 15 students in several RLC's taking the class for the entire semester (45 contact hours). At Chico, in the ITFS classroom, was the instructor and the technician handling the camera and transmission. By utilizing the ITFS system the university provided a service that would have been difficult and costly to the 15 students interested in the course content.[11]

One Instructor's Experience With ITFS

This writer, while on the faculty at CSU, Chico, taught three regular semester courses in social science curriculum development (Fall 1977, Fall 1978, and Spring 1979) and one team taught pre-summer session (1978) course in social science concept formation utilizing the ITFS system. Course enrollments varied from 5 to 17 students, the latter course had students in the six, then operational, RLC's. Interaction between the instructor and students and among students was strongly encouraged and achieved generally by taking time in class to become acquainted with the students, "personal" telephone calls, as appropriate to the course, and "personal" notes included with the weekly mailings of class handouts. A real esprite de corps developed in class and among the isolated students despite widespread geographic distances between the instructor and class on campus and students in the RLC's. In one instance, the instructor taught a class session from a RLC which could be described as, "reasonably successful," and certainly not outside the realm of possibility. Teaching from the RLC provided an opportunity for a personal exchange between the instructor and the students in that particular RLC. Students were invited to come to campus, if possible, for one session when they were scheduled for their own class presentation.

While voices from RLC's soon became recognizable, it was always nice to "see" the voice in person. Many times "voices" and "personal looks" were not as one imagined. At times, when students from the RLC's would come to campus, they sought out the ITFS instructor for a personal friendly chat even after the course had been completed. Student feedback was appreciated.

Teaching on ITFS necessitated advanced planning on the part of the instructor and working closely with the excellent technical staff members to prepare materials, etc. Before each class this instructor would brief the technician as to any special requirements for that particular session. On the other hand, students and the instructor did plan together in order to meet more effectively the needs and interests of the students taking the course during a given semester.

Since the instructor liked to use class handouts on a regular basis, rather than one assigned text, this meant that materials for use in class the following week had to be prepared and ready to be mailed no later than on Friday for use on the following Wednesday (when the class was scheduled). Even then sometimes there were delays in the mail and so alternative methods of presenting the lesson and/or an alternative lesson needed to be ready. Students enrolling in ITFS courses do have access to library resources through the regional interlibrary loan system.

This writer incorporated many different teaching methods and learning activities into the class. Many of the activities involved a great deal of direct student participation and interaction and use of media, e.g., films, filmstrips, etc. With the exception of some types of simulation/gaming activities which involved a great deal of student interactions and contacts between students in two or more RLC's virtually every other type learning activity could be and was presented over ITFS.

Student and Faculty Response to ITFS Instruction

As can be imagined not all students liked taking courses using ITFS -- usually it is either "love the system" or "hate the system." Some students take one class over ITFS and find this type of learning is not to their liking or does not fit their learning style. In this case, the less than positive attitude may develop because of the nature of the course, the mode of instruction, the personality of the instructor, the subject matter content, the number of students at a particular RLC and/or the amount of student-instructor interaction and student-student interaction. Technical problems in the system may interfer with student learning in the RLC's.

Like the students, some faculty members may "love" or "hate" teaching through the ITFS system. Some faculty members scheduled to teach on ITFS did not feel comfortable using this mode of instruction and decided not to teach on ITFS. At times classes have been cancelled by the instructor before classes started. In some instances the faculty cancelled courses after one to three class sessions. Perhaps these faculty members did not understand the potential and/or limitations of ITFS technology. At least one instructor taught an entire semester over ITFS to the regular on-campus students and for one student in a RLC.[12] In some instances the enthusiasm for the system by a faculty member in one department may have encouraged other members of the department to offer a course on ITFS. Likewise, a negative experience with ITFS may discourage other faculty from teaching on ITFS.

Each year efforts are made to encourage other faculty members to teach a course on ITFS in order to provide a variety of courses in different academic areas. Faculty using ITFS are encouraged to teach on ITFS in much the same way as possible as they would in a regular on-campus classroom. Orientation sessions are regularly held to invite faculty and staff members to view the excellent physical facilities, to share concerns and insights, and to ask questions. Excellent technical assistance is readily available to help faculty prepare needed visual materials. Some faculty members have taught several courses on ITFS.

Overall ITFS has offered 99 courses and has served some 600 plus students. Enrollments have ranged from a single student in several of the courses to a high enrollment of 63 in a special anthropology course on King Tut offered at the time of the King Tut exhibit in San Francisco. Part of this course included a field trip to San Francisco to view the exhibit. For various reasons, one third of the courses have been cancelled. The Department of Education has offered the largest number of courses through ITFS.[13]

Daytime Responses to ITFS

Initial transmission times, except for summer sessions, were during the late afternoon or evening. During the Fall 1979, daytime transmission of four courses was attempted. Two courses, "Marxist Philosophy" and "The Women's Movement" had no enrollments while two other courses, "Psychology of Prejudice" and "Cultural Transmission," an anthropology course, had a total of 3 students in RLC's. While initial efforts to attract student enrollments to daytime use of ITFS were not overly successful, it is anticipated additional efforts to attract students to enroll in daytime ITFS courses will be made.

During the current semester daytime courses scheduled in ITFS included eleven courses for 33 hours of transmission in ten academic disciplines. Six courses were scheduled for transmission from 8:00 AM through 2:00 PM each Monday, Wednesday and Friday. Five courses were available from 8:00 AM through 3:15 PM on Tuesday and Thursday.[14] At the time of this writing current enrollment data from this semester are incomplete. Five of the courses were cancelled. A small number of students are traveling to the RLC's for the remaining six courses offered during the day.

Promoting Enrollments

It is possible to attribute low enrollments in ITFS classes and the seemingly high cancellation rates to several forces, some perhaps beyond the direct control of the university.[15] For example, the academic year calendar for CSU, Chico, and the community colleges where three of the RLC's are located do not correspond. In the fall the community colleges begin their academic year, some two to three weeks after CSU, Chico, is in session. This probably limits the number of community college students who might otherwise enroll in an ITFS course.

Another area of concern is getting advance information and publicity out to the residents of the service area in sufficient time to enroll in classes. An active promotion campaign involving local media might prove fruitful. Three other areas affecting enrollments may be the type of courses offered on ITFS, the time courses are scheduled, and the geographical distance and driving time from students' homes to the RLC's. Transportation and other related cost factors may contribute to limited enrollments.

A need assessment or survey questionnaire to determine attitudes toward ITFS instruction and specific interests of the residents of the region might assist CSU, Chico, in offering courses and/or other activities to meet more effectively the unfilled needs and/or interests of the potential student. If students had information about future course offerings several semesters in advance, it is possible more students would enroll for courses, if it was evident courses would be offered which would enable students to meet degree requirements, if desired, within a reasonable time frame.

Another condition influencing enrollments may have been the fee structure for ITFS instruction. Until now students paid the higher extension fee rate rather than regular fees for the state support program. Beginning with the current semester ITFS students, if they meet admission requirements become regular state support students and pay the regular fee schedule of $90.50 for one to six units and $110.50 for over six units. Other fee structures for External Degree and Extension students still exist. Special fee structures exist for some courses which have received some financial support from grants.[16]

ITFS and Home Learning

Beginning with the Fall 1979, residents in the Yuba City area subscribing to NORCAL Cablevision have the opportunity to enroll in ITFS courses and learn while remaining in their own homes. The direct cable transmission is sent out over the airwaves "scrambled" and which can be deciphered only in homes with the appropriate "brown box" available from CSU, Chico. The box is loaned to students enrolling in a course and paying a $20 deposit (refundable upon return of the box at the end of the semester) for use of the "box" at home during the semester the student is enrolled in a course.[17] This arrangement with Cablevision allows every home served by the Cablevision company to become a center for home learning. This arrangement may prove beneficial for handicapped and others unable to come to the central campus or a RLC.

Possible Future Directions for ITFS

ITFS has the capability of reducing geographic isolation and extending learning possibilities by providing nor-credit public lectures, forums and concerts, by offering academic advising for off-campus students, and by offering continuing education units through in-service seminars, conferences, workshops and demonstrations for professional groups and other specialized audiences. General interest and personal development courses could be offered to up-grade skills and to broaden experiences. ITFS can be an important tool to promote equality of educational opportunity.

As to the future, efforts are currently underway to expand the ITFS network eastward across the mountains to Quincy and Susanville. The RLC's in those locations will be at the community colleges. A grant of $230,000 has been secured for this purpose from the Department of Commerce. In addition, if funding can be secured, plans are to equip all the RLC's with radios rather than continue using telephones. Radio communication will allow for more effective use and greater student interactions and participation. If low cost government loans could be obtained the ITFS system could be further developed and/or expanded.

Some time earlier, CSU, Chico, received satellite transmission from the Canadian/American Communication Technology Satellite (CTS) for redistribution over the ITFS network. Before the satellite receiving equipment, on loan for the experiment, was removed, CSU, Chico, received and transmitted the Third Asian and Pacific Television Conference in June 1978. CSU, Chico is now being considered as a possible site for a future conference by this same group. Individuals at CSU, Chico, and in the CSUC Chancellor's office are investigating the possibility of acquiring a satellite for CSU, Chico.[18] This possibility could mean transmitting courses and other educational and cultural programs over a wider geographic area including transmission to ships at sea, by extending the range of broadcasting. Establishing linkages with other systems would increase the scope of services available.

It may be that rising education costs for both the university and the students, especially energy and transportation costs, declining on-campus enrollment of traditional students, more adults returning for courses, and the fall out effects from California's Proposition 13, means that regional educational agencies and social service institutes will have to share limited but valuable resources in order to control spiraling costs in order to survive in the coming decades. ITFS can effectively serve the milti-needs of Northeastern California's segmented subgroups. It just may be that more effective utilization of ITFS will assist residents of Northeastern California to learn more about themselves and gain new perspectives about the world around them by bringing the classroom to the student through national and international cultural exchange opportunities. With the new technologies, distance is no longer a barrier to increasing knowledge through learning.

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PLANNING INTERACTIVE EDUCATIONAL PROGRAMS
PROJECT TRAIN: TEACHER RETRAINING ACCORDING TO IDENTIFIED NEEDS
A CASE EXAMPLE OF HUMAN RESOURCES CENTER

William H. Frohlich
Communications Specialist/Project Coordinator
Research and Utilization Institute
Human Resources Center
Albertson, New York

Human Resources Research and Utilization Institute is a nonprofit organization dedicated to improving the quality of life of severely physically disabled people. The Institute has undertaken the planning of a project which will provide in-service training of regular classroom teachers who may have had little or no experience with disabled students. With the enactment of Public Law 94-142, Education for All Handicapped Children, the regular classroom teacher may find disabled students on his or her roster for the first time.

Prior to P.L.94-142, some handicapped students were placed either in special schools or special classes as a matter of procedure. Other handicapped students, due to their basic lack of mobility or transportation, were relegated to homebound instruction provided by itinerant teachers. Since the regular classroom teacher had no experience with special populations, teachers trained in special education provided for the handicapped students' needs.

The implementation of P.L.94-142, mainstreaming of handicapped students, has been a slow process. The federal government has pressured the states to enact procedures to insure the mainstreaming of handicapped students in the regular classroom setting and provide for in-service training of the regular school faculty. The Bureau of Education of the Handicapped, as part of the Department of Education in Washington, awards grants through its Division of Personnel Preparation.[1] These grants to states, both direct and indirect (to service agencies), have been distributed to provide for training the regular faculty in the public school system.

The New York State Educational Plan (1979,80,81) includes as objective 3:

> "To train 17,000 regular education teachers in matters related to successful implementation of mainstreaming by June, 1981, through 30 hour in-service training courses to be provided through the New York Training Network."[2]

In order to help New York State meet this objective, the Human Resources Center has envisioned a 30 hour in-service training program to be offered in the fall of 1980. Project TRAIN (Teacher Retraining According to Identified Needs) has been created by Dr. John Palmer, Director of Educational Research at Human Resources Center. This project is being enacted in order to support New York State's mission to train 17,000 teachers by reaching as many as possible over a three year period. An affiliation with St. John's University allows the project to grant graduate credit to the participants.[3]

Reaching large numbers of people in a short period of time presents the most difficult problem to solve. Also, when the population to be served is spread across a vast geographic area, the problem is multiplied. To start down the road toward solutions, one must seek a systems approach. The system that already exists in the State of New York is the college course. Unfortunately, it is inadequate to provide for large numbers of faculty. A college course for these teachers, conducted in a classroom, creates a problem in meeting the goal of training large numbers in a short time. Across the State of New York, in-service courses are being offered at Baruch College, Hofstra University, City University of New York, and the State University branches in Albany, Buffalo, and

Plattsburgh.[4] In any particular region of the state, faculty members interested in such a course may be a hundred miles or more from the nearest training site. When offered, a course may be taken within the state's training network which includes 47 training sites but only ten full-time trainers.[5]

Demographics

In the downstate region alone (New York City, Long Island, and the Mid-Hudson Valley), there are approximately 112,000 handicapped students which is about sixty percent of the state's handicapped student population (Table 1).[6]

This student population is moving increasingly from the special educational setting, whether in a special school or in a homebound education program, to the regular classroom environment. The regular faculty in the down-state region numbers more than 91,000,[7] and they must be afforded the opportunity to receive the appropriate training. With the largest populations found in and around cities, a systems solution to the problem may be applicable to other areas.

Selecting a Delivery System

Within the context of the above considerations, the delivery of service must be cost effective. Individual college courses are expensive and do not reach the large numbers necessary. Mass communication is seen as a necessary part of the solution. Television has the capability of reaching the prescribed audience, but broadcasting via commercial or public television is too costly.

Investigating alternative broadcast media led to ITFS (Instructional Television Fixed Service). This system exists within many Catholic Dioceses in the United States as well as other educational institutions. It *cannot* broadcast to people's homes. However, as signals are transmitted to Catholic school classrooms in various geographical areas, ready-made training sites become available. What the ITFS network *can* do that commercial or public broadcasting cannot is to provide for two-way television transmission between sites.[8]

Development of ITFS

Instructional Television Fixed Service began in 1961 in the Plainedge School District in Plainedge, New York, with the issuance of an experimental license to operate in the 2000 megahertz range. The authorization by the FCC mandated that the use of the frequency be limited to "structured, curricula-integrated programming."[9]

Today there are approximately ninety ITFS systems throughout the country. These ITFS networks provide either one-directional or two-directional communication as limited by each system. As a closed circuit, the content transmitted via microwave cannot be received without the use of special equipment. Hence, it is not available to the home consumer as is cable television, but rests within institutions: public and private schools, universities, social service organizations, and hospitals (Table 2).[10]

Within the scope of the ITFS system utilized for Project TRAIN, a fourteen county area will cover in excess of 6,000 square miles populated by more than 12 million people.

Planning Participation within ITFS

ITFS systems can provide direct face-to-face interaction between individuals or groups by simultaneously sending and receiving the television signals. In planning this interactive educational project, which will link together fourteen to twenty sites, the total interaction model of communication becomes difficult to enact. The educational goal still involves allowing participants the opportunity to feed back directly to the instructors, ask questions if they so desire, and to share information with the larger group. It would not be possible for all groups to see and hear each other at any given moment.

Audio teleconferencing, as a support to a one-directional television transmission, enables the

TABLE 1

New York State Handicapped Student Population
1978/1979

Downstate Region 111,635			
N.Y. City	Long Island	Mid-Hudson	Upstate New York
55,454	33,887	22,294	70,121

TOTAL: 181,756

TABLE 2

Nationwide ITFS Usage 1979

City Schools	Religious Related Institutions	Universities	County Schools	Educational Consortia/ Social Service Organizations	Medical Schools
25%	23%	20%	19%	11%	4%

instructor(s) to send information in both audio and visual form and allows participants to respond in the audio channel only. Each site will utilize a Darome convener consisting of two microphones and a speaker coupled to the existing telephone handset. Through a protocol (discussed later), the participants at each location will have an opportunity to participate.

Within the limitations of the system described, the interaction of participants may be encouraged.

Delivery System

Currently in-place in the fourteen county downstate region are three ITFS systems. These systems are owned by the Catholic Television Network (CTN) and operate in conjunction with the local Catholic diocese in each area. The systems cover the fourteen county area shown in Table 3.[11]

These 460 schools are reception points for a full-motion color video and audio microwave transmission centrally broadcast within each diocese. Each diocese has its own origination and production facilities and is operated independently of the others. Within the scope of Project TRAIN, is the interlocking of the three systems never before attempted. Enhancing each system's send/receive capability will allow the fourteen county network to exist.

Approximately one to two sites in each county will be selected for use as a training center. (See Diagram A)

With a projected class size of twenty-five at each of the fourteen to twenty locations, 350 to 500 participants will receive a live transmission and be able to respond. The potential number of participants is much greater within certain limitations.[12]

The additional audio component provides the interactive loop. The project will provide audio teleconferencing equipment at each selected site. Darome, Inc. will bridge all lines together with the central broadcast studio in Yonkers, New York. This will permit participants to ask questions of the

TABLE 3

Catholic Television Network (CTN)
Downstate New York Microwave Transmission System

Diocese	Counties Covered	Sites with Reception Capability	Totals	
Rockville Centre	Nassau	48		
	Suffolk	23		
		Diocese of Rockville Centre	71	
Brooklyn	Brooklyn	125		
	Queens	75		
		Diocese of Brooklyn	200	
New York	Bronx	61		
	Westchester	39		
	Manhattan	34		
	Staten Island	25		
	Dutchess	10		
	Orange	8		
	Rockland	6		
	Ulster	5		
	Sullivan	1		
		Archdiocese of New York	189	
		Total Sites		460

TABLE 4

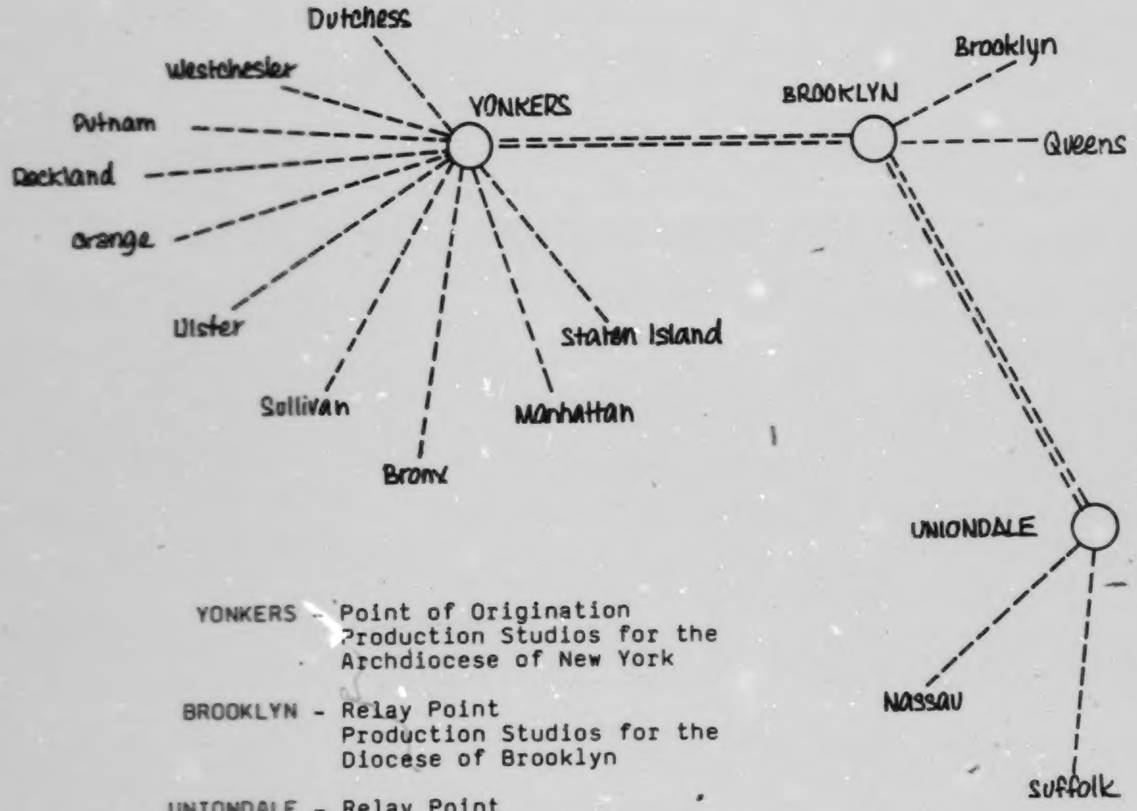
Typical Program Interaction

Session Elements		Communication Technology	Type of Interaction
I.	Introduction of topic objectives of the session	Television (Mass communication)	One-directional
II.	Formal presentation by instructor(s)	Television (Mass communication)	One-directional
III.	Audio/visuals. Case studies presented	Television (Mass communication)	One-directional
IV.	Panel of experts discuss cases	Television (Mass communication)	One-directional
V.	Panel entertains questions	Teleconferencing (Mass communication)	Two-directional
VI.	Small group activities	Classroom (Interpersonal non-mediated communication)	Multi-directional
VII.	Homework, plan of action	Research/writing (Intrapersonal communication)	Two-directional*

*Two-directional in that one receives the content material and then sends his information (understanding) back as a paper or plan of action.

DIAGRAM A

DOWNSTATE NEW YORK
ITFS NETWORK


Dutchess
Westchester
Putnam
Rockland
Orange
Ulster
Sullivan
Bronx
Manhattan
Staten Island
YONKERS
BROOKLYN
Brooklyn
Queens
UNIONDALE
Nassau
Suffolk

YONKERS - Point of Origination
Production Studios for the
Archdiocese of New York

BROOKLYN - Relay Point
Production Studios for the
Diocese of Brooklyn

UNIONDALE - Relay Point
Production Studios for the
Diocese of Rockville Centre

faculty in the studio and will allow all to benefit from both the questions and answers broadcast back through the network to all sites.

Program Design

Each of the ten programs will vary in design and structure, but will have common elements based on the principle of "education through interaction." The term "interaction" is used here in four ways:

1. Participant interaction with material/content
2. Participant interaction with others (peers)
3. Participant interaction with instructors
4. Participant interaction with the media.

A typical program design:

I. Introduction of topic and objectives of the session

II. Formal presentation by instructor(s)

III. Audio/visuals. Case studies presented

IV. Panel of experts discuss case studies

V. Panel entertains questions

VI. Small group activities

VII. Homework assignment

The structure of a program must reflect the four modes of interaction described above. In very practical terms, participants will: a. observe a live, formal presentation, b. observe an audio visual presentation, c. observe and participate in a panel discussion, and d. participate in small group activities.

Content Preparation

Addressing the problem of mainstreaming handicapped students means providing faculty members with practical knowledge about how to provide education on a daily basis. They need information on the special needs of the handicaped, modifying existing curricula, coping with attitudinal problems, adapting facilities and procedures, and safety among other topics.

The curriculum, developed by Dr. Palmer, addresses these concerns with ten sessions designed to provide practical experience:

Session 1 - Public Law 94-142 (and other legislation)

Session 2 - Individualized educational plans

Session 3 - Defining the population of students with disabilities

Session 4 - Attitudes toward the disabled

Session 5 - Accommodating the disabled in the regular school setting

Session 6 - Support services to the classroom

Session 7 - Library/media/information resources and services

Session 8 - Adapted physical education

Session 9 - Health

Session 10 - Special concerns

Molding the Content to the Medium

The medium being discussed here is primarily television augmented with interactive audio. In any one session of the program, a number of different media or levels of communication may occur (Table 4).

In numbers I, II, III, and IV in Table 4, the thrust of the session lies in delivering information. Part V provides an opportunity for response and clarification. Following that, VI allows participants to share their personal experiences, while VII asks them to apply what they have learned in a plan of action.

Planning Checklist

Checklisting is an excellent way of looking at the component parts of a project to better understand the total planning process. The listing which follows may not include all foreseeable elements, but for planning purposes it should be flexible enough to handle any future concerns. If checklisting is handled properly, one should gain a perspective on cost categories, how activities will be carried out, and a basic sequence of events.

The following is a checklist specific to Project TRAIN:

Tasks	Project Start	Project Finish	Actual Completion	Cost	Comments
Programs					
Session One					
Session Two					
Session Three					
Session Four					
Session Five					
Session Six					
Session Seven					
Session Eight					
Session Nine					
Session Ten					
Steering Committee					
Selection of steering committee					
First committee meeting					
Second committee meeting					
Content					
Project staff assignments					
Development of sessions					
Development of AV support					
Test of each session					
Reproduction of content material					
Development of evaluation forms					

Tasks	Project Start	Finish	Actual Completion	Cost	Comments
Evaluation by steering committee					
Evaluation by site coordinators					
Evaluation by participants					
TV Studio					
Pre-production meetings					
Technical rehearsal(s)					
Schedule air-dates					
Arrange for program recording					
Arrange for program editing					
ITFS					
ITFS transmission test					
ITFS hardware (as needed)					
Audio Teleconferencing					
Meet with Darome representative					
Rent equipment					
Install equipment at sites					
Test bridge					
Train site coordinators on equipment					
Reserve bridge times for conduct of sessions					

Tasks	Project Start	Project Finish	Actual Completion	Cost	Comments
Sites					
Selection of on-site staff					
Prepare training session for on-site staff					
On-site staff training					
Telephone test at site					
Project - University					
Planning meeting					
Staff assignments					
Site responsibilities-payments					
Public relations planning: . Local media announcements . School districts . Brochures . College catalog . Direct mail					

Coordinating Delivery and Reception of Service

The sites in the fourteen counties will be coordinated with the diocese supplying the classrooms for use by the project. Each site will be inspected for its appropriateness as a training center, and a technical check of the room's ITFS and telephone capacity.

When all sites are aligned and tested, a system of protocols for the use of the sites during the conduct of the training will be enacted. During the questioning phase of a program, all sites will be on-line for audio interaction. To avoid everyone talking at once, the host of the television broadcast will entertain questions by site on a pre-arranged basis alloting a fixed amount of time per site. Although this can be very restrictive, it does permit questions from all sectors of the training region.

The transmission of the television programs themselves will be "live" from the Archdiocese of New York's Yonkers' studios. When the program times are scheduled and the presenters and studio staff have been rehearsed, the training session is automatically delivered via microwave to all sites (see Diagram A).

Evaluation

The evaluation component of the project determines the effectiveness of the content and the medium, as well as the entire project.

The Content - For the content of a particular session to be considered useful to the participants, they must see the practical application of the material to their daily classroom situations. The evaluation component must address this. The areas of concern are cognitive, attitudinal, follow-up, and effectiveness.

TABLE 5

Evaluation Design

Area	Evaluation	Evaluates	Evaluator	Evaluated
Content	Cognitive	Basic knowledge	Project staff	Participants
	Attitudinal	Attitude change	Project staff	Participants
	Follow-up	Lasting effects	Project staff	Participants
	Effectiveness	Content material	Site coordinators	Programs
Medium	Point of origin	Quality of transmission	Steering committee	Programs
	Point of reception	Quality of reception	Site coordinators	Programs
	Audio	Quality	Site coordinators	Teleconferencing
Training	Medium as training tool	Appropriateness Effectiveness	Participants Project staff Site coordinators	Project

The Medium - This evaluation is both of the technical quality and efficiency of the medium. The evaluation of the medium will be in the following areas: technical evaluation at the point of origin, technical evaluation at the point of reception, and technical evaluation of the audioteleconferencing.

The Project - This evaluation is a conclusion drawn from the above and determines the effectiveness of the medium as a training tool.

Once the evaluation categories are established, the evaluation instruments themselves must be created. In addition, the question of who will be the evaluator must be answered (Table 5).

Future Applications of the Medium

Within the fourteen county downstate New York Region, the three ITFS systems are in a state of readiness to be a conduit for a variety of training sessions or informational/educational programs. The ability of each system to transmit high quality full-motion video is unquestioned. Although the three systems have been in existence for many years, they have not been associated as a downstate network until the enactment of Project TRAIN.

The power of a downstate interactive network remains to be seen. Training population segments which lie outside of New York City may be the important challenge. As the interactive ITFS network is validated here, its application to other parts of the country may become clear.

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12. The Darome Audio Teleconference Bridge can serve up to twenty sites through one telephone number. By coordinating a few telephone lines, the total number of sites is multiplied.

TELEMEDICINE IN NORTHWESTERN ONTARIO**

Christopher A. Higgins*

Earl V. Dunn#

David W. Conrath*

*Department of Management Sciences, University of Waterloo

#Department of Family and Community Medicine, University of Toronto

**This study was funded by the doctors of Ontario via PSI Foundation, Ontario

ABSTRACT

In this paper a slow scan telemedicine system designed to assist in remote health care delivery is described and the nature of its use is outlined. The system is operating out of six communities in northern Ontario, and two teaching hospitals in Toronto. At present it is being utilized approximately forty times per month. Usage of the system can be divided into three broad categories; medical consultation, education and social therapeutic contacts. Specific examples are given. After two years of operation the system has been accepted, usage is expanding and the communication mode is now considered an integral part of health care delivery. The equipment is operated by the regular health workers without expert help, and has been felt to be a significant contributor to better and more personal health care.

INTRODUCTION

For the past several decades increasing attention has been given to the problems of health care delivery to remote and isolated populations. Suggested solutions can be placed in one of three general categories: the use of non-physician providers, physician incentive plans and telemedicine. The latter of these, telemedicine, involves the use of telecommunications technology to assist in health care delivery. In this paper an operational telemedicine system is described and various aspects of the system are discussed.

The telephone and radio have been used for many years to assist in providing health care. In 1950 Greshon-Cohen and Cooley described their successful attempts to transmit X-rays via standard telephone lines. The results were satisfactory, but the cost of the equipment was excessive. During the next twenty years technological advances were made, and by the late 1960's several telemedicine projects had been initiated. The best known of these connected the Logan Airport in Boston with the Massachesetts General Hospital by means of a two-way broadband video system (Murphy & Bird, 1974).

Throughout the early 1970's there were many experiments testing telemedicine technologies (Park, 1974; Conrath et al, 1975). Unfortunately, most were experiences rather than experiments in the true sense of the word. Little was done in the way of evaluating the impact of the communications technology, and comparisons among alternatives were ignored. More recently, several studies have compared alternative communication modes (Conrath et al, 1977; Moore et al, 1975; Sanders et al, 1976). Each of these experiments came to the same basic conclusion: Increased sophistication of technology (and thus cost) gave little or no increase in the ability of the technology to assist in health care delivery. In other words, for most purposes, cheap, reliable technology was as good as the more expensive equipment available.

With these results in mind, it was now time to make some comparisons in a situation where the need was real. Consequently, we installed a slow scan television system tying together five isolated communities, a regional hospital and two tertiary hospitals. This system was to be compared with existing telephone and radio communication networks in terms of effect and costs versus benefits.

THE AREA

The Sioux Lookout Health Zone in northwestern Ontario provides health care to over 10,000 people living in an area of 285,000 square kilometers (twice the size of the state of New York). The people live in 27 small communities, none of which is large enough to support or justify a resident physician. For the most part, the only transportation between communities is by small bush aircraft, on floats in the summer and on skis in the winter.

Seven of the larger communities, with populations ranging from 350 to 1,000, have nursing stations with resident nurse practitioners who provide daily health care. These nursing stations have minimal laboratory and X-ray facilities and a small complement of beds so that patients can be kept under observation for short periods of time. However, for most investigations or hospital treatment the patient must be transferred to the Zone Hospital or to the 'south'.

The other smaller communities have indigenous health aides who provide emergency care and some daily health care. Their training is very limited and they work under the remote supervision of a nursing station. Nurses make regular bi-weekly visits to these communities, accompanied by a doctor approximately once a month.

The Zone Hospital, the medical and administrative center of the system, has a complement of four family physicians and the Zone director (traditionally a physician). In addition, specialists from the Universities of Toronto and Manitoba make regular visits to the area. The Zone Hospital physicians attempt to visit each nursing station twice a month and each other community monthly, although this is not always possible, weather being a significant factor. The distances between the health aide stations, the nursing stations and the Zone Hospital are not trivial, averaging about 75 kilometers from health aide to nursing station and about 250 kilometers from nursing stations to the Zone Hospital. Toronto is over 1500 kilometers away.

THE SLOW SCAN SYSTEM

The slow scan telemedicine system operates in eight locations: two in communities with health aides, three in communities with nursing stations, one at the Zone Hospital and two in Toronto teaching hospitals (one pediatric and one adult).

Each telemedicine unit consists of a speaker telephone (Northern Electric Companion II), a slow scan video system (Colorado Video), send and receive monitors (Electrohome), a video camera (Dage) and an X-ray view box. The hospital units are augmented with two store monitors so that several pictures can be viewed simultaneously. The slow scan video system consists of a frame storage device, a transmitter, a receiver and a modulator/demodulator. The camera is equipped with different lenses and has a zoom facility. It operates with simple room illumination although an X-ray view box is required for roentgenograms. The slow scan system is capable of transmitting black and white pictures over the telephone lines to another location (or locations using conference bridging) in 78 seconds. Common transmissions are of X-rays, E.K.G.'s, skin rashes and burns.

The system has been in operation since August, 1977, and by the summer of 1979 had been used on over 500 occasions (approximately 40 cases per month). It is also used for regular weekly educational programs. The equipment is operated for the most part by the regular health workers, that is, by the nurses, doctors and other indigenous people. There are no regular project staff at each location to maintain and operate the equipment. In spite of this lack of trained technicians and operators, there has been infrequent and short 'down time'. This is due to the simplicity of the equipment and the fact that there is a complete set of spare replacement parts to install when needed. Trouble shooting and exchange of equipment are accomplished by nurses and other non-technical people.

SYSTEM UTILIZATION

The system is used for three main purposes: medical consultation, education and social therapeutic contacts. The uses have been divided fairly evenly among the three areas, although recently the educational focus has become more active. With over 500 cases it would be impossible to discuss all aspects of the telemedicine system. However, we will outline the common applications in each area and give some examples.

Medical Consultation

The two most frequent types of consultations have been those between nurses and doctors and those between doctors and subspecialists. The majority of these have been for the transmission and interpretation of X-rays, but there have been consultations regarding E.K.G.'s, plastic surgery (burns), dermatology, physiotherapy, microscopic slides and dentistry. As long as there are no technical problems, the transmitted image has nearly always been satisfactory for the consultant. The transmission of data has facilitated discussion and clarified problems. There has been little concern regarding the quality of the transmission. It does take some time and familiarity with the equipment to be able to get an ideal picture but satisfactory transmissions are easy to obtain. In fact, there have been occasions when a nurse who has never used the equipment, on the instruction of the physician at another location has successfully transmitted X-rays.

The direct costs of these consultations are usually less than $10.00 for those between nurses and doctors, and less than $25.00 for those between doctors and subspecialists. Many of these exchanges have resulted in cost savings. To illustrate, let us go through a sample case. An individual fell from a snow machine and injured his leg. He was taken to the nursing station and X-rayed. There was an obvious fracture but the nurse was not certain whether she should transfer the patient to the Zone Hospital or to a larger center for special orthopaedic care. She contacted the Zone Hospital and arranged with the family physician to transmit the X-rays for his opinion. By agreement, 15 minutes later the nurse telephoned the telemedicine office where the physician had turned on the equipment and was prepared to receive a transmission via slow scan video. Within 10 minutes the physician had received three views of the ankle and had ascertained that there was a trimalleolar fracture. This fracture could not be handled adequately at the Zone Hospital and so the patient was transferred directly to a larger facility for definitive management.

What were the costs and benefits in this case? The doctor and nurse took 15 minutes extra to make their decision. The telephone and slow scan transmission costs were about $3.50 (excluding capital costs). The patient had one direct airplane transfer rather than two trips. This was much more comfortable for the patient and saved about $150.00 in air fare.

Education

The educational potential of this telemedicine system is being explored and expanded. The first regular use of our system for formal education began in July, 1978, when weekly X-ray rounds for the staff at the Zone Hospital were initiated. Each week a senior radiologist in Toronto reviews X-ray films selected by the Zone physicians. While these rounds are designed for educational purposes they frequently result in changes in patient management. As many as 18 films have been transmitted and discussed within the hour demonstrating the capacity for rapid setup and transmission.

Once a month, using conference calls, a radiologist conducts similar more basic rounds for the northern nurses at the three nursing stations with the video system. Additionally since May, 1979, weekly E.K.G. rounds have been conducted from Toronto. There is more structure in the E.K.G. rounds as the cardiology staff in Toronto are attempting to review common problems in an ongoing way. These rounds which cost about $60.00 per hour are attended by both medical and nursing staff members. The system has also been used for seminars such as psychiatry and plastic surgery. Furthermore, the E.K.G. and X-ray rounds have been accepted by the College of Family Physicians of Canada as hour for hour required study credits for membership in the College.

The system has been used for inservice education. For example, a plastic surgeon in Toronto observed a burn patient via the system. He was able to ascertain the degree of the burn and the need for skin grafting. He outlined the technique for debridement and management of the burn. The discussion and the video pictures were recorded and later replayed for the nurses on the ward caring for the child. This resulted in better management for the child and was educational for the nurses.

There have been uses of the system for patient education. The hospital physiotherapist has used the system to instruct the family of a stroke patient on how to do the appropriate exercises so that the patient could return to her home. The nurse in the remote nursing station observed the instruction and was able to supervise the family's endeavours. The management was successful with an earlier return than normal of the patient to her own family.

Social Therapeutic Contacts

Admissions to the Zone Hospital are especially difficult for the Indians because of their very close community and family ties. Patients and their families are typically disturbed by the separation and the distance. The telemedicine system is used on a regular basis to lessen the isolation and loneliness felt by the hospitalized patients. For example, prenatal patients who have been transferred to the Zone Hospital for delivery have weekly sessions with their family back home. They can both talk and view pictures of each other. After a baby is born, a picture of the child is transmitted back to the family to aid in the early bonding process.

The system has been used to lessen isolation and fears related to being away from one's family. For example, a woman with several children was flown from her community to the Sioux Lookout Zone Hospital for investigation of several symptoms. Within two days the patient stated that all her symptoms were gone. After talking to and seeing her family via slow scan television she related that she had been worried about her children. After seeing them she was reassured about their well-being. Because of this reassurance she admitted that her symptoms were still present and agreed to remain in hospital for investigation.

RESEARCH

Since the inception of this telemedicine project data have been collected on diagnosis, management and other aspects of health care for all clinical encounters in the Sioux Lookout Zone. The 1978 encounters are summarized in Table 1.

Table 1

Summary of 1978 Encounters

	Nurse	Health Aid	Doctor	Total
Patients Seen	33,162	9,536	5,151	47,849
Diagnoses	43,407	12,044	6,781	62,232
Referrals	1,560	472	257	2,289
Communications	691	659	48	1,422
Transfers	603	181	143	927

In 1980, after two years' of data have been processed, we will compare those communities which have slow scan television units with those serviced by telephone and/or radio. Changes in health care will be investigated and a cost/benefit assessment related to the telemedicine system will be carried out.

There was initial resistance and hostility to the system. However, the results of a recent questionnaire indicate that after two years there have been considerable attitudinal changes and the system is now accepted.

CONCLUSIONS

The slow scan video system is feasible to use and provides a valued service. The costs are not exorbitant. It can be used for consultations, educational sessions and for reducing the loneliness of isolation and separation. One of the more welcomed features of the system is the educational aspect which is continually expanding.

The present system is relatively inexpensive, the operating costs are low and the system can be maintained by the medical staff with minimal help from technical experts. There are cost savings but as yet a full cost-benefit analysis has not been done. Down time and equipment problems have been minimal. The quality of transmissions of pictures is adequate and the staff elect to use the equipment more than 40 times per month. Early indications are that the system alters health care and it appears that this is for the better.

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CMITS: COMMUNICATION AND CRAFT*

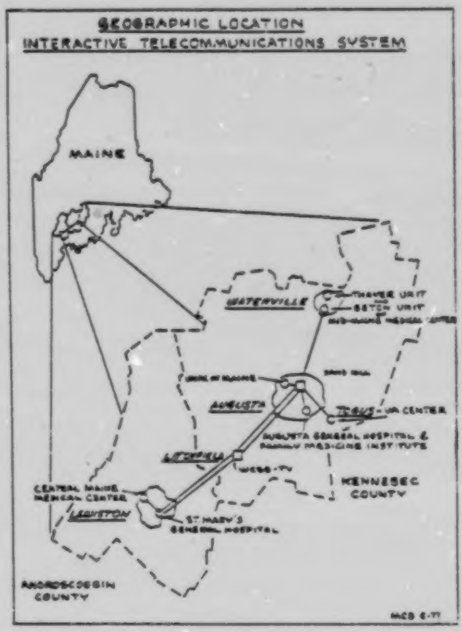
Anne Niemiec
Assistant Project Director
Central Maine Interactive Telecommunications System
Medical Care Development, Inc.
Augusta, Maine

Video teleconferencing is like folkcraft. Both are used to meet everyday needs. Both depend on good design and can incorporate technology without losing the craftsman's touch, as a potter using a motorized potter's wheel or electric kiln. Like many folkcrafts such as quilting, video teleconferencing involves those who use the product in its cooperative production. The Central Maine Interactive Telecommunications System is demonstrating that one does not have to wait for standardized centrally distributed education products to come to them. They are producing their own with craftsmanship that builds the community in the process of responding to local needs.

DESCRIPTION

The Central Maine Interactive Telecommunications System (CMITS) is a user-operated, two-way telecommunications microwave system which links five hospitals, a family practice residency program and a university to meet a variety of educational and patient care needs. These include meetings, continuing medical education, courses (credit as well as noncredit), nursing programs, and other educational events including programs via satellite. The System became operational in August 1977 and was originally funded under Exchange of Medical Information Grants from the Veterans Administration to Medical Care Development, Inc. (MCD), a nonprofit health care delivery organization. It is now paid for by the participants and programs are currently running on the average of 35 hours per week--almost all live and interactive.

The CMITS interconnects Augusta General Hospital and the Family Medicine Institute (the practice unit of the Central Maine Family Practice Residency) in Augusta; Central Maine Medical Center and St. Mary's General Hospital in Lewiston; Thayer and Seton Units of Mid-Maine Medical Center in Waterville; the VA Medical and Regional Office Center at Togus; and the University of Maine at Augusta. The signals from each site converge on the Augusta relay point at Sand Hill where a program may be routed to only one or any combination of the facilities.



GEOGRAPHIC LOCATION
INTERACTIVE TELECOMMUNICATIONS SYSTEM

The System is oriented toward actual user operation with a minimum of technical intervention. Each participating facility has been provided with identical equipment so that programs may originate from any location with equal ease. Controls and layout of the equipment were made as simple as possible to minimize some of the tension which accompanies the initial use of new technology. The System also provides for exceptional confidentiality since only stations specifically selected by the originating site can view or hear programs in progress. A site may send a picture to one, all, or any combination of the sites. It is possible for three separate two-way television conversations to take place simultaneously. We have recently started a limited amount of double programming, one involving two sites broadcasting to each other and the other interconnecting the remaining sites.

Design

As with any craft, the design is of prime importance. With the CMITS, the design process included both human and technological elements. Prior to implementation, Robert Cowan (until recently, Director of CMITS), with a background in communications and satellite experience, did extensive research on both ongoing and past unsuccessful telecommunications systems and designed the CMITS to avoid some of the people and technology problems that plagued the other systems.[1] He involved key hospital people in the planning and was careful not to introduce the System as something that would solve all problems. He let it evolve slowly. There were face-to-face meetings so people got to know each other before the technology was in place.

The overall objective of the System is the development of cooperative educational programs in which no institution either receives or transmits all network programming, but shares in the development and implementation of the network content. The CMITS attempts to create an educational balance of payments in which each institution that is a member of the System both exports and imports educational programming equally. Each institution has its educational strengths and weaknesses, and it is the function of the CMITS to share those strengths. There is no involvement of a major medical center or teaching hospital. The participants are of relatively equal size and capability. While most of the programs use resources from within the participating institutions, speakers from the wider community are shared as well. With its accessibility and range of resources, the CMITS helps to establish an information environment that encourages the integration of continuing professional development into the daily life style.

USES

The prime ingredient of this cooperation is the user group which is composed of one or more representatives of a specialty area from each hospital, such as directors of social work, medical records personnel, and plant operations' directors. There are 28 different user groups employing the System to facilitate education, communication, and consultation. The user group meets on the System to discuss areas for programming based on needs which they have identified. The group is then involved in the design, implementation, and evaluation of the programming. The process, as well as the product, is important. It has become truly inventive planning as described by Ziegler in Planning as Action. "Inventive planning is grounded in a belief in the intrinsic worth of human beings who, by their nature and irrespective of their official position in society, possess the potential--and often the actual--to act competently with a view to their own future."[2] Ziegler emphasizes that the social setting for this process should be local--homes, churches, workplaces, neighborhoods, communities. In this setting they can be encouraged to "bring their practical wisdom and critical imagination to play."[3]

Considerable planning, or impetus for planning, comes from the inservice education directors, who formed the first user group. This group meets monthly to initiate or develop educational programs applicable to professions that are not themselves user groups and other programs applicable to the broad spectrum of hospital staff. The range of programs is increasing as hospitals become more involved with community health education and preventive medicine for workers in the hospital and in other areas. Tai Chi, a combination of dance and exercise, is one example of a program developed for more than one audience. It can also be made available to patients by connecting the CMITS to patient television systems.

Nursing furnishes an example of one profession using the CMITS in a variety of ways. The CMITS delivers continuing education programs planned by nurses in the five hospitals and the University. Some of these programs are planned in the individual sites, some by nurses in more than one site using the CMITS as a vehicle for cooperative planning.

Nurses also attend continuing medical education programs on CMITS and take courses, such as social gerontology, which can be used as electives towards a university degree. The System is used for monthly meetings by professional nursing organizations such as the Association of Operating Room Nurses of Maine and the Critical Care Nurses Association. Nursing students on clinical rotation in the hospitals are able to attend programs giving them information and an example of the professional development of nurses in action.

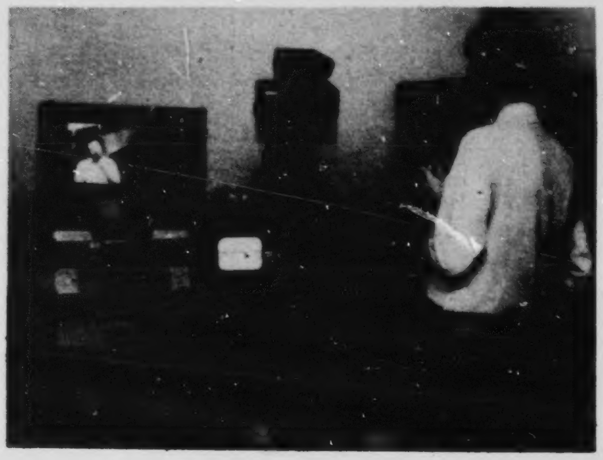
The use of the CMITS specifically for and by nurses began with a four-part series which sought to provide a forum for the exchange of ideas and to increase the access to continuing professional development through the sharing of resources. This series included clinical conferences, management in nursing sessions, nursing updates, and specialty perspectives. As an outgrowth, user groups in nursing specialty areas formed and have planned their own programs. The latest use is by the night shift nurses who have recently started using the System at 3:00 A.M.

An interactive User Group meeting on CMITS.

Sharing on a larger scale is also taking place. Certain courses need to be repeated every year for a variety of specialties, such as coronary care nursing, neurological nursing, clinical pharmacology, etc. Unitl recently, each hospital has provided all these courses for their own staff or sent people to other locations. A plan is being developed by the inservice education directors whereby each hospital will provide only one course, sharing it over the System, and receive four others in return. Two of these courses are underway. These efforts are part of cooperation which results in an educational balance of payments.

Some user groups make particularly good use of the visual component of the System. One of the most successful programs in this regard (as well as others) is the monthly meeting of infectious disease specialists. Cases in various states of resolution are presented using charts, x-rays, etc. Opinions are exchanged to arrive at the diagnosis of a current case, or in completed cases, how treatment might have been improved. Physical therapists have demonstrated various methods concerned with gait training, using the equipment available to videotape examples for live discussion. Care does have to be taken in order to make the visuals effective.

Courses needed by employees are offered on a credit and non-credit basis. Resources within the hospital are used for both the planning and the implementation. A modified instructional development approach was used in a university anatomy and physiology course in which each of the five hospitals contributed audiovisuals and/or instructional resources; among others, a pathologist provided slides and health care specialists taught about the body system in their fields of expertise. This multiple resource approach in which the instructor becomes a manager of the educational environment will be used in other courses.



Two-way conversation between media specialists.

Courses which were originally intended to be taught at one location are now taught on the System, thereby cutting travel. For example, certification courses for respiratory therapy technicians were developed by the directors of respiratory therapy who had used the System for their own professional development. When the price of gasoline started to escalate, they suggested putting the courses on CMITS, saving two trips to Waterville and 220 miles of driving per week for Lewiston participants. The need for alternatives to travel is increasingly on peoples' minds.

GROUP COMMUNICATION OVER DISTANCE

We are increasing our awareness of the differences between group communication over distance and face-to-face and learning from our own and others' experiences to improve communications.

--Over distance there is generally more attention to the task, though if the individuals in a group know each other well and the meeting is very informal, this is not necessarily the case.

--Consensus can appear to be reached when in fact it is not there. Conflicting opinions appear later in separate conversations and the issue needs to be dealt with at the next meeting.

--There is more potential for control of group interaction by monopolizing the screen. If the group feels at ease with the equipment and with itself, interaction comes easier.

--There are not as many cues from non-verbal communication. Some people are better at giving these cues; they are able to encourage questions or receive clarification by their gestures and expressions. Each site is able to control another site's camera, with permission, so that they can zoom in and out and thus get a closer look at whoever in the group at another site is speaking. Having control of the camera helps to increase the amount of non-verbal information.

--In the user groups the communication pattern is most often radial, sometimes leader-centered, but rarely "Y" or hierarchical, resulting in more lateral than vertical communication.

--The seating arrangement can make a difference. Sitting in a row in front of the camera is not effective. The best results have been reported when the camera is placed as if it were a member of the group.

The technology obtrudes less when motivation is high, be it for information or overcoming a feeling of isolation. Some of these considerations can be seen as drawbacks, but overriding all is the fact that there is more access to remote resources--to people, to viewpoints, and to information.

Although much of the communication takes place within professions in the user groups, some cross-disciplinary groups exist, such as those concerned with implementing interdisciplinary team work in hospitals and a networking group which is just getting started. The latest group, composed of a number of different professionals from institutions within and outside of the System, is meeting to discuss the construction of alternative futures for at least 25 years ahead.

We have found that communication is also enhanced within institutions because of the System. Department heads at one hospital, after completing an assertiveness training course on the System, continued to meet formally and informally to give each other the feedback and reinforcement much needed in the process of trying to change behavior. The System serves a catalytic function, introducing people and ideas. One person, new to the area, received a job as a result of making a presentation on CMITS. Another side effect is the increase in self-esteem for some people which occurs from overcoming the fear, not only of the technology but of making presentations and successfully communicating at meetings. This carries over to other aspects of their jobs.

TRAINING

The media specialist at each site

is responsible for seeing that the users are trained to operate the System on their own. There are various training modes and varying degrees of skill reached. We list five competency levels ranging from basic operation of the equipment to moving the console from one location to another. In this area, as well as others, we are trying to pay attention to individual learning styles so that a person can learn from the media specialist, or alone using the competency lists and a manual, or from peers, individually or in groups. We are encouraging more peer training. Carey has pointed out, and our experience corroborates, the potential advantages of peer training: "...; common language...less concern about 'looking foolish'...ready access to peers for repeat demonstrations."[4] An introduction to the System is part of the orientation program for new staff at each hospital. To help with this and as an adjunct to other training, we are working on a videotape which will include how to operate the System and how to enhance presentations through the use of audiovisuals.

On the average it takes three interactions before a level of comfort is reached. We have seen some dramatic changes, for instance, someone who at first was not comfortable even being in the room when the System was on is now giving presentations and encouraging others to do so.

In addition to training, the media specialists act as liaison between the hospitals and the System. Their diverse backgrounds in media, psychology, education, and radio enable them to provide the individual hospitals and the CMITS with technical, media, and program planning assistance. The media specialists are employed by the participating institutions rather than by the System. Although this decreases their control by the System, it increases their ability to be effective within the institutions.

MARKETING

Although much of the programming is user group oriented, hence the users are involved in the planning process and aware of what is coming, we are becoming increasingly aware of the importance of marketing the programs to those who may have the need but who are not part of the user group. This has particular implications for career development or careers in transition. For example, a secretary interested in becoming a pharmacy technician can take a pharmacology course. The accessibility of continuing medical education programs allows different health care professionals to attend and provides the opportunity for discussion with physicians and colleagues about mutual patients.

Weekly announcement sheets are sent to the hospitals for distribution to departments and individuals. Courses and special programs appear in special announcements. We are using attendance records to develop a computerized index of individuals interested in certain areas and sending out special mailings on future programs in their interest area. Individual contact, although time consuming, has been especially effective. We definitely keep in mind the "bridge role" that our marketing efforts have in relating staff needs and resources.

EVALUATION

Evaluation has been an ongoing process since the beginning of CMITS. An attendance form and an encounter form are used to gather utilization and satisfaction information. The encounter forms are short and ask questions on relevance, accessibility, visuals, overall rating, and have a space for future program suggestions and comments. The forms work as a source of information for ongoing improvement of programs and a way of noting needs. The suggestions for future programs are passed on to the appropriate user group or brought before the inservice education user group for consideration. The forms are used for troubleshooting; feedback, both positive and negative, is passed on to the instructors. We encourage immediate feedback via the System by students to instructors, but the forms provide a mechanism for those who are reluctant to do that. More in-depth evaluations are conducted following each course and follow-up evaluations are done six weeks later. Evaluation meetings with instructors are held during and after the courses.

There are personal as well as institutional costs that are affected. The System can be seen as a way of conserving human resources as well as material energy resources. The following equation helps to illustrate this point:

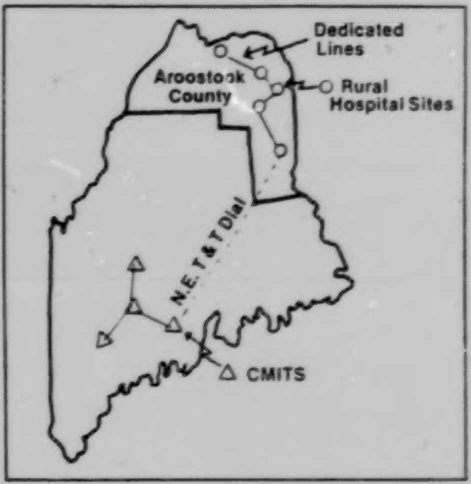
$$\text{Margin} = \frac{1 - \text{Load} + \text{Cost}}{\text{Power} + \text{Benefits}}$$

Gibson describes its use in predicting whether an individual will engage in a learning experience.[5] The two factors that primarily affect the learner because of the CMITS are accessibility (location is at the worksite which eliminates cost of travel) and availability in terms of content and resources. In addition, there are the social reinforcement benefits of learning in a group. The System works to effect a cost savings system of education and communication leading to an increase in competence. "Competent people are those who can create valuable results without excessively costly behavior."[6]

SLOW SCAN DEMONSTRATION

Medical Care Development, Inc. has recently been awarded a grant from the Office of the Assistant Secretary for Planning and Evaluation, Department of Health, Education, and Welfare, for a telecommunications demonstration project in Aroostook County. This will allow an interface between the broadband two-way system and slow scan technology which converts a moving image to a still picture and then transmits the visual material to other locations via telephone lines. The participants in this project are four hospitals and a mental health center in Fort Kent, Caribou, Presque Isle, Houlton, and Fort Fairfield. This audio and still-image video conferencing system will provide: (1) talk back and interaction with program originators in the central portion of the State, (2) the ability to utilize slow scan equipment for intracounty conferencing, and (3) interconnection with the CMITS so that Aroostook health professionals may lecture and participate more fully in the educational activities outside the County. Aroostook County, the northernmost county in Maine, is poor, rural, and has severe manpower shortages in some health fields. Involvement of these persons in educational programs that meet their professional development needs, as well as provide peer contact, will greatly reduce the isolation factor that contributes to the manpower shortage problem.

The slow scan expansion to Aroostook involves the same philosophy of user self-sufficiency as CMITS. In these beginning months before the equipment arrives, we are working to develop and strengthen the communications bonds between the participating sites and to identify risk-tolerant individuals as first users. Enthusiasm and interest is high. The hospitals have for some time been receiving the CMITS weekly program announcements. One of the inservice educators referred to it as a "Christmas wish book." Efforts are being made to develop the interest that already exists in the central Maine area. They, too, are looking forward to meeting their counterparts.



The demonstration will provide people in the County with the opportunity to experiment with new forms of telecommunications technology and develop a system which most closely fits their needs, demonstrating that "the greater the involvement of the user and the greater the focus on participatory education, the more transparent the communications system becomes."[7]

CONCLUSION

We are working to increase the amount of choice and control over the kinds of information and education that is needed. The next step will be to choose from an array of communication technologies. One combination that is possible is described by Glassmeyer as a "wedding of the computer and video technologies" that "will open up enormous opportunities for the development of interactive training systems and other two-way communications applications."[8] We are looking at other combinations, always keeping in mind the cooperative craft in what we are doing. "...choices of media for a given communication need will not be simple choices: they will require a careful blending of communication resources and needs. Communication--electronic or otherwise--is a craft. As with other crafts it cannot be taught mechanistically. It must be developed through personal experiences."[9]

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THE EVOLUTION AND INTEGRATION OF INTERACTIVE TELECOMMUNICATIONS IN THE SYSTEMS APPROACH TO HEALTH CARE DELIVERY

Robert A. Cowan
Director
Telecommunications
Research Medical Center
Kansas City, Missouri

Abstract

For the past two decades a variety of sectors in the health care industry have experimented with telecommunications with considerable variance of success. The reasons are complex, but some common features do emerge. This paper will explore some of the problem areas, highlight some of the more recent successes and offer a brief glimpse at the future areas worthy of exploration.

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Just over 100 years ago Alexander Grahm Bell invented the telephone. But Bell's early thoughts were that the telephone would be a tremendous educational instrument -- bringing the world's greatest speakers and performers into the homes of thousands. In fact, the first demonstrations of the telephone were centered around its potential entertainment nature (Barnouw, 1966). In 1890, over 2,000 people in Providence heard an orchestra in Boston play the Star Spangled Banner. Later that year a group of 800 at the Grand Union Hotel in Saratoga heard a concert from Madison Square Garden, and people in the home of a telephone sales executive danced to the music at a party. The utility of the telephone as a two-way communications device was recognized for business, but was deemed as too costly for the average person. It is interesting to note that the use of a two-way technology for the one-way transfer of information as a precedent was already being established in those early experiments. It is interesting to reflect on the fact that we are still trying to overcome 90 years of habits and integrated stereotypes about the nature of the communications process.

Similarly, radio's first broadcasts were of an entertainment nature when Miss Gloria Van Boos sang "I Love You Truly" from Dr. Lee De Forest's New York laboratory in 1907 (Barnouw, 1966). People did not know how to deal with the new communications medium. Plays developed exclusively for radio used elaborate stage settings, and microphones were disguised as lamps so as not to intimidate the actors and actresses.

With the advent of television in the mid-1930's, almost all broadcasts were of dancers and other presentations in which movement was the prime ingredient to highlight the new medium (Head, 1972). Due to the insensitivity of the television cameras, early performers had to wear green make-up and purple lipstick in order to look human to the home viewers. Union regulations limited actors to only ten minutes in front of the cameras due to the extreme heat generated by the lighting levels necessary for the broadcasts. And early televised soap operas were nothing more than cameras pointed at actors delivering lines for radio.

The point is that there are two elements to the introduction of any new communications technology: A tendency to utilize the new medium based on past experience with other modalities and an initial lack of technological sophistication.

An early study by Park (1974) was the first major effort to address the problems and successes being experienced by the telecommunications efforts in the health care industry. The report was a very complete document that attempted to bring together, for the first time, the collection of antidotal information that researchers could use for the formation of new hypotheses concerning the nature of two-way telecommunications. It is unfortunate that very few researchers took up the challenge to seriously explore the limits and bounderies of the models in use at that time. One of Park's less publicized discoveries, however, was the role of participants in the diffusion and development of the technology -- or "Innovation" if you will. Up until that time the emphasis seemed to be on the use of existing hardware and, unfortunately, the existing uses of that hardware were also carried forward into the two-way demonstrations.

Basically, six major problem areas seem to have emerged during the early days -- or the first-generation applications. First, the telecommunications systems were grossly oversold to those in Washington and those to be involved in the demonstrations. Telecommunications was to be "The" answer to health care delivery problems. Naive? Perhaps, but no more naive than the similar over selling of video tape and video cassette recorders when they were introduced. The problem? The hardware was there . . . The software was promised but what was delivered was of low quality or too expensive for any of us to afford. This type of exuberance is only natural, but is certainly not realistic, and project people ended up being apologists more often than not. Just as television and film have not replaced the classroom teacher, no communications system should be seen as a total solution -- only as another means of achieving a desired objective with increased efficiency. Every communications system has its strengths and weaknesses, and all participants should be made aware of that fact at the outset.

Secondly, the vast majority of the communications system initiated over the past twenty years -- and even today -- have been designed in part by people who have spent their lives in either commercial or educational television and are used to working with very high quality cameras and studio equipment, which are also very expensive. Expensive not only from an initial purchase price, but also in terms of the technical support required at every juncture and ongoing maintenance. I am not saying that high quality is bad, only that few seemed to realize the long-term costs involved in supporting high qulaity systems following the termination of federal monies.

Third, with an emphasis on complex electronic hardware came the realization that considerable engineering support was necessary. The early systems were not only personnel intensive, which was bad enough, they were personnel intensive in the hardware phase rather than the user sensitive aspect of production and program development. Early hardware did not help the situation much. The cameras were bulky, heavy and required some form of operator. The electronics were not similar to the automatic devices we now know and the multiplicity of control functions simply intimidated and overwhelmed potential users.

Fourth, the early uses of telecommunications were rather single-dimensional. Initially, the emphasis was on "Telemedicine," or the direct patient/physician use of television or used as a support system for a physician's assistant, etc. This type of use did, and does have its place in remote areas such as Alaska, Dr. Earl Dunn's section of Canada and other areas of the world where access to health care is extremely limited. However, the bulk of our country is not Alaska, Northern Canada or Brazil. The pre-conditions for application of similar telecommunications systems are not quite the same. Early research by Dr. Bird (1975) and others (Chapanis, 1976) has shown that mediated tasks tend to take longer and may not be the best use of a physician's time. Even though there are some indications that newer technologists and methods may be changing that picture, the early approach of telecommunications as the answer to emergent medicine may not be the best or most effective use of telecommunications in the health care setting.

Fifth, if one were to develop a model to describe many of the first-generation experiments, it would have to be a one-to-many approach. The centralized resource utilizing telecommunications much like spokes on a wagon wheel to reach the areas of need. The flow of communications was primarily one-way with those in the field being given an opportunity to only ask questions. The concept that the rural setting may have information of interest to the major medical center or university did not seem to have occurred to many. Nor did the fact that those in the rural setting might want to communicate with just one another. In addition, the programs presented by some of the major medical centers, while interesting, were not applicable to the problems faced by rural practitioners on a daily basis. In fact, some seemed to be more oriented toward influencing referral patterns than providing relevant educational events.

Finally, the evaluation data, especially in the area of determining cost effectiveness, was very poorly done. Only a few demonstrations attempted to tackle the issues, but tended to ignore many of the strengths that telecommunications offers -- such as access to events occurring elsewhere without the need for travel. Obvious, you say? Well, not at the time, it was felt by many researchers that the issues were so complex that it was better to simply ignore them until later. Without good attempts to deal with the problems and research the cost benefit issues, the cost of telecommunications seemed extremely expensive. There was simply no point of comparison available.

Now we move into the second generation of teleconferencing systems. It should be remembered that by "Generation" I do not imply any advances in technology, but rather changes which represent a more holistic approach to the use and integration of telecommunications into the daily melieu. The Alternate Media Center Demonstration in Reading, Pennsylvania, the Interact System in New Hampshire and Vermont, the work here in Madison, exceptional efforts by the Institute For The Future and the Central Maine Interactive Telecommunications System have done more to push back the frontiers of participatory communications than any previous ventures.

From my own perspective, the Central Maine System has been and continues to make one of the most interesting contributions to the field in the application of two-way telecommunications to distributed information sharing. The Central Maine model is the first to break completely from the traditional one-to-many design. The system, which is also being described by Ms. Anne Nieniec at this conference, is the first to interconnect facilities of comparable size and resources with identical capabilities to originate and receive. In addition, the Maine system broke new ground in developing (1) A diversity of uses including patient-physician contact, meetings and a variety of educational events and (2) A diversity of users extending from administrator, physicians and nurses through hospital volunteers, plant operations personnel and members of the outside community. Given the equality of the participants, the model which has developed might be considered an "homogenous-group many-to-many" configuration.

Four broad philosophies seem to emerge from the Maine efforts: First, that the eventual users of the information should be involved in the entire communications process. The equipment should be designed for user operation, the users should be trained in educational process and interpersonal communications skills, and appropriate forums created to allow for the free interchange of ideas and sharing of infomation without constant intervention by technicians or system personnel.

Second, the communications media should attempt to augment existing communications patterns rather than modify or replace them on a wholesale basis. Areas of common interest should be isolated by designers and not attempt to totally satisfy the needs of each facility -- such a massive effort fails to recognize the need for inter-institutional variations in operational procedures

Third, users of the system should be trained in the evaluation of their own efforts and be held responsible for the outcome of the mediated event. The second-generation traditional model has stressed the role of professional producers, writers, and directors which removes content control further from those in need of the information. In addition, due to the traditional model's emphasis on the production component, programming tends to be unresponsive or have high turn-around times from idea inception through the completion of the program. The Maine System foregoes some of the production values to develop a more responsive posture.

Fourth, system use should be distributed among the various participants. With each facility capable of identical transmission capability, functional components of programs should originate from the facility with the most appropriate resource. The Maine System has successfully integrated multiple-point interactions within a program time block so that separately located guest speakers can teach and interact with an instructor located elsewhere. The permutations are endless. I would strongly suggest that you visit the Maine System if you are interested in a non-traditional use of telecommunications. I use the term telecommunications, instead of video, advisedly -- what had been developed in that rural area has tremendous applicability to all forms of interactive communications, not just video. The lessons learned tend to focus on the people-issues and how technology might be adapted to the user needs.

The third-generation communications systems are just now beginning to emerge. Based on a role model where telecommunications augments distributed information sharing, or participatory events, newer technologies and techniques will begin to catch up with the new breed of users. Several new telecommunications demonstrations funded by H.E.W., including an innovative approach to the integration of broadband and slow scan television in northern Maine, will be shifting some of the focus from vendor-driven to a user-driven hardware. The newer equipment is becoming more automatic, with control functions that are more natural and less intimidating, and will be capable of responding more quickly to the variety of materials used by the participants on a daily basis.

In terms of delivery systems, the new communications platforms being built for launch this year or next will provide for a considerable increase in the flexibility and capacity for interactive telecommunications (Fordyce & Jaffe, 1978A & 1978B). Utilizing narrow band modalities will permit two-way transmissions for considerably less money than was required just five years ago. This new focus on two-way interaction is encouraging, for it means the recognition of interchange and information sharing.

The newer telecommunications efforts will begin to utilize some of the newer technologies and resultant increased access to achieve communications patterns based on need and interest rather than geography. For some time I have proposed that a demonstration of the new satellite scanning beam technology be conducted among the northern states where winter health problems are common. These participatory discussions could begin to address some of the problems and successes in dealing with mid-winter depression and other issues which occupy much of the northern, rural provider's time.

A major philosophy that hopefully will begin to be implemented more frequently might be called the "Third-Generation Distributed Model." In this equalitarian configuration, interactive transmissions will be between the most appropriate users and resources bypassing much of the centralized control we are accustomed to seeing at present. The path analysis would appear to show a star pattern rather than the classic wagon wheel. With equality of transmission capability and the ability for remote or rural sites to interact among themselves to share peer level experiences, the new generation systems should offer a quantum enhancement in accessibility. The problem of course, will be the de-mystification of the technology for the users and creative guidance to lead the users beyond their stereotypes and into a region where interpersonal communication is the preferred mode.

The new generation systems will need to address the critical mass problems associated with large scale transmissions and the logistical problems which turn two-way communications into one-way events. Problems associated with the distribution of written materials, scheduling, coordination of facilities, interaction protocals are all significant issues that dilute the interactive event. Other models and methodologies for breaking mass groups into smaller interactive units may be developed. These interaction-packets may be convened before or after major presentations so that an interchange of concepts and experiences might be shared.

The path to the new generation systems will not be easy for most of us. Washington has grown highly reactive to the word "Telecommunications" with more and more agencies stating that they will not fund telecommunications. There is an unfortunate attitude in Washington at the present time which discounts telecommunications as too expensive and fails to recognize that much is yet to be learned about the infusion of telecommunications into the daily life stream. There are, of course, several exceptions to that attitude, but we must work to re-educate those with which we deal if we are to develop viable alternatives to travel problems.

I believe the future to be bright and the decade will bring us closer to that magic combination of creative use and creative engineering. It would appear that all of us in the field will also see systems developing which integrate several technologies in an effort to maximize system's responsiveness to user needs and demands. The prime focus, however, should not be the technology, but rather on the development of a creative sensitivity to the needs of the user community and steer the systems to meet those needs and provide new, exciting services.

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A PROPOSED MODEL FOR EVALUATING TELEMEDICINE*

Rashid Bashshur
Professor
Department of Medical Care Organization
School of Public Health
The University of Michigan

Introduction

Telemedicine has been proposed as a new system for providing health services in certain settings in which telecommunications technology can be effectively utilized to substitute for face-to-face contact between providers and clients of care. This new system, though not intended as a total replacement for traditional arrangements of clinical practice, is conceived to encompass an organizational structure that is uniquely suited to the use of telecommunications, and brings with it a new set of medical provider roles and role relationships which facilitate communication and control over the primary task of delivering health services. A major aspect in the appeal of telemedicine has been its promise of redressing serious and widely recognized problems in health service delivery such as the shortage of medical manpower in certain areas and the general maldistribution of medical manpower in the country as a whole and the consequent inaccessibility of high quality medical services to some segments in society. To the extent that access to health care is denied as a result of the unavailability of providers, for reasons of distance, scheduling, or organizational eligibility, then the communications extending facilities of telemedicine offer promise as a solution.

Detailed descriptions of telemedicine systems, including various configurations of technology, manpower, organization and setting are available in several publications.[1] For purposes of this paper, telemedicine is simply defined as the application of some type of telecommunications technology to the clinical practice of medicine without the requisite physical presence of provider and client but with sufficient exchange of information to enable diagnosis, treatment, and follow-up. During the last two decades, these systems have been demonstrated and sometimes evaluated in various settings including fee for service, primary care clinics, neighborhood health centers, operating rooms, nursing homes, group practices, hospital wards, jails, and American Indian reservations. Yet, despite the varied experiences, there are only limited conclusions regarding the efficacy, effectiveness, relative cost and other effects of telemedicine, thereby suggesting the need for further evaluation and research if the basic questions about telemedicine are to be answered. It is the purpose of this paper to propose a comprehevsive model for the evaluation of telemedicine as a technologic innovation applied to pivotal aspects of the health service delivery system, namely that of communication and control over the conduct of the process of care. Nonetheless, the basic approach does not simply involve the assessment of the effects of the overlay of telecommunications technology onto existing systems of delivery, but in the analysis of the basic issues involving the structure, process and outcome of health service delivery and then in a systematic and comprehensive assessment of all the effects, both intended and unintended, of the integration of telecommunications with this structure and process.

In order to provide a meaningful background for the proposed model, first some general remarks will be made about the nature of the demonstration and evaluation efforts to date.

Evaluation of Telemedicine

In the late 1960's and early 1970's, several federal agencies with missions in health, technology and telecommunications funded research and demonstration projects in telemedicine.

The initial purposes of these projects were to determine the feasibility and clinical efficacy of interactive (two-way) telecommunications as a substitute for face-to-face contact or physical presence of both patient and provider during the clinical encounter. It was assumed that if the trip to the doctor can be obviated through telecommunications then some patients without ready access to physicians can benefit by the use of the new medium. The first evaluative questions were rather simple: can this be done without significant diminution in the quality of care provided through the medium? Can physicians obtain sufficient information to enable reliable diagnosis? Will patients accept to use the system? and similar other questions. As the feasibility and efficacy of the new medium were demonstrated at variable levels of success, the question, shifted to its ultimate justification in terms of costs and benefits and to an analysis of its effects. The question of cost effectiveness of telemedicine systems in comparison to traditional clinical practice was raised, as were questions of acceptance by providers and clients and the ultimate effects of the system on quality of care. Indeed, after several years of preliminary technical design, shakedown and testing, some telemedicine projects were able to provide direct patient care and at the same time collected some data on their performance. On the basis of those studies, several fragments of research have now appeared in the published literature.[2] Nonetheless, to date there has not been a broad range systematic effort to address all the basic pertinent issues in the assessment of telemedicine. Thus what we know about telemedicine today is quite limited to certain aspects of its performance. Policy decisions regarding the funding of telemedicine were often adversely affected, although much of the information utilized was a mixture of annecdotal and and inconclusive empirical findings. The following may further clarify the lack of generalization from the studies of telemedicine.

(1) It has been noted that most telemedicine projects barely utilized the full capabilities and capacities of the technological and organizational systems installed. Thus, their full benefits were not realized. In some instances, this is attributable to the short period in which funding for the project was provided. In other cases, the broad band interactive television and other telemetric and support technologies had capabilities far in excess of organizational and community need. There remains the need to examine simpler, lower cost and more readily available technologies, that could be more fully, and therefore more cost-effectively, utilized.

(2) Nearly every telemedicine project which has been mounted in the past has had narrowly defined functions or special target population groups. These functions have included supervision of anesthesia administration, airport primary care clinic, radiological consultation, and psychiatric interviewing, to name but a few. Client populations have included Indians on a reservation, jail inmates, nursing home residents, indigent clients and villagers in isolated Artic Circle communities. Thus there remains the need for a broad demonstration of the capabilities of telemedicine applied to the needs of a non-captive, general client population.

(3) Despite extensive funding of telemedicine projects in the past, few firm conclusions concerning telemedicine in health service delivery can be made today. Our own research has found that client and provider acceptance of the technology is rather high, and it tends to increase with experience and familiarity.[3] Telecommunications technologies used direct patient care have been found to represent an "innovation bundle", the adoption of any part of which is dependent on the receptivity to the others.[4] Nonetheless, much less evidence is available on the other effects of telemedicine. In a review of the state-of-the-art in 1977, we concluded:

> "The implications for the future of telemedicine as a mode of delivery of medical care are apparent. The union of high technology, alternative provider types, revised organizational structures, and basic changes in the content and conduct of the personal encounter between patient and physician will require demonstrable and generalizable benefits to a far greater degree than existing systems have been able to provide. Ultimately, the fate of telemedicine may rest not on its proven worth to uniquely identified dis-

> advantaged population groups, but on its proven applicability to a broad spectrum of the population."[5]

While this problem may not be unique to telemedicine, both the professional and the policy maker who is concerned with telemedicine have to sift through voluminous and uncoordinated materials, possibly without being able to reach any definitive conclusions regarding the real merits and problems of the system. The model proposed here was developed specifically to meet this need, i.e. to provide a systematic framework from which the various configurations of telemedicine systems can be evaluated, and specific questions about its performance can be answered. For instance, the basic question about the appropriate band width for cost effective systems can best be answered in terms of clinical trade offs (process variables) and specific benefits (outcome variables). That is to say, the question about band width (audio, video, real time, black & white, color, etc.) is posed in terms of the information provided for specific clinical functions and the ultimate affect on the health of the patient. Indeed, all the other basic questions about telemedicine can be addressed in the same way. Hence, the efficacy and effectiveness of telemedicine systems can be ascertained in terms of several kinds of effects and trade offs for specific levels of technology.

The Proposed Model

Three basic assumptions underlie the proposed model:

1. In view of the costs, (both capital and maintanence), staffing and organizational requirements (use of non-M.D. providers and multi-site delivery settings), it is unlikely that telemedicine systems will be developed except in areas where the need for such systems is manifest. These are primarily areas that suffer from medical manpower shortage, where distance to medical care is a problem, and where some segments in the population suffer from lack of access to care. This is important to specify because it tends to determine the type of systems that are likely to be developed. While these systems may not be the ideal ones, they will be the ones to be evaluated.

2. Telemedicine systems are likely to evolve in several different configurations of size, technology, manpower mix, organization and service population. In other words, it is not expected, at least in the foreseeable future, that we will have a single unified consistent model of telemedicine. Instead, depending on need and resources, these systems are likely to be developed in various forms utilizing different combinations of medical and non-medical manpower, different types of organization and different levels of technology. For instance, in widely dispersed rural communities that suffer from doctor shortages, emphasis will be placed on use of non-M.D. providers to staff satellite clinics and low level technology, whereas in densely populated urban areas emphasis will be placed on consultation between generalist and specialist M.D.s and the use of sophisticated technology. If this is the case, the role of the non-M.D. in rural areas is pivotal but not so in urban areas, and different technologies need to be assessed in the two settings.

3. Therefore, it will not be meaningful to evaluate telemedicine from a fixed perspective involving a single system with fixed characteristics. Indeed, these systems have to be evaluated in terms of the specific configuration of manpower, technology and organization available at each site, but from a systematic perspective that enables maximum generalization from the findings.

The proposed model consists of two stages: The first is largely descriptive and documentary in nature, and it focuses on the configuration of the system under consideration, its design characteristics and its objectives. The second is analytical, and it consists of applying the systematic model herein proposed.

In outline form, the following is a detailed listing of the parts that constitute each of these two stages: the description of the system and the analytic model to be used in its evaluation. Stage one has three parts: the configuration of the system, its objectives, and related issues.

I. The configuration of the system will be ascertained in terms of the design characteristics, system objectives and

1. The design of telemedicine systems contains the following variables:

   a. organizational structure: group medical practice; multi-site delivery setting; partnerships; solo practice.

   b. manpower mix: M.D., specialty, non-M.D. provider technicians.

   c. technology: bandwidth, relay, display, communication requirements, supportive technology.

   d. service population: characteristics of population and environment: dispersed, confined, disabled, deprived.

   e. special requirements: system planning, training of personnel, data requirements, cost-sharing requirements.

2. The basic objectives of telemedicine will be viewed from three perspectives:

   a. For the consumers, the pertinent objectives include the following aspects of care: accessibility, convenience, cost, quality, satisfaction.

   b. For the providers, the following are the key issues: clinical quality (gains or losses in information), productivity, supervision of non-M.D. providers, role performance.

   c. From the point of view of the system of health care delivery, the following issues are pertinent: system integration, efficiency of operation, cost effectiveness, coordination with other service systems in the community, the substitutability of transporting information and people.

3. Related issues:

   a. The fit between specific technologic components (type of equipment) and service requirements.

   b. the loss and/or enhancement of information via telecommunications, clinical applicability by site and type of care.

   c. acceptance by providers, users, and community at large.

   d. the right to privacy and violation of civil rights and related legal and ethical issues.

II. The analytic model consists of a two-dimensional matrix involving structural components as independent variables and health delivery components as dependent variables. The components and the specific variables contained in each are as follows:

The structural components

Communication medium: telephone, radio
slow scan
interactive television
person-to-person

Provider mix: non-M.D. providers
technicians
M.D.

Organizational form: solo
group
hospital-based

Service population: confined
dispersed
indigent
normal

The health delivery components

Process of care: scheduling
waiting time
service time
patient flow
case finding

Content of care: diagnosis
treatment
follow-up
prevention

Outcome: For the User: health status
satisfaction
For the Community:
availability
accessibility

Cost: capital
operational
maintenance

Acceptance: providers (M.D. and
non-M.D.)
users

The model is designed as a matrix involving both of these two sets of variables (structural and delivery components) simultaneously. The matrix can be used partially such as examining the various health delivery effects of different communications media or it can be used in its totality such as the examination of the various health delivery effects of specific configurations of structural components. The complete matrix is as follows:

Health Delivery Components

Structural Components	Process	Content	Outcome	Cost	Acceptance
Communication Medium					
Provider Mix					
Organizational Form					
Service Population					

A diagramatic presentation of each of the two sets of components in the proposed matrix may be useful. These are provided in Figures 1 and 2. Nonetheless, further clarification is in order. The most important structural components that include not only telemedicine systems but also traditional clinical practices are presented in Figure 1. On the second level are the four major components of communication medium, provider mix, organizational form and service population. In contrast to telemedicine systems, traditional clinical practice of personal, primary care sought and delivered between an individual client and a solo physician rendering care in a face-to-face encounter is presented in capital letters. To the list of providers available have been added specialists and new nonphysician providers such as nurse practitioners and physician assistants and technicians who may be needed to operate the system. Some patient care is now rendered through these new manpower types with the physician's role becoming in some instances one of supervision, advice, and consent. However, with increasing numbers of non-M.D. manpower types involved in the delivery of care, the responsibility of the supervising physician for communication and control of the care has been heightened.

The setting in which medical care was delivered once was the house visit of the family doctor. Even the office visit, still a dominant form of face-to-face delivery of care, is changing. Particularly, the telephone as a means for communication, and for diagnosis and treatment, is firmly entrenched and accepted by both providers and patients. In the case of telemedicine new forms of communication such as radio, slow scan television, and interactive television are utilized. However, the major point to be make here is that whatever system of telemedicine evolves, it is describable in terms of a specific combination of the structural components contained in Figure 1. The list is meant to be exhaustive, but the specific combination of variables can vary depending on resources available, community need and acceptance. However, all combinations or configurations are ideally evaluated in terms of their effects on each and every component of health care delivery.

Specific Issues for Evaluation

While the proposed model affords flexibility in its implementation and regardless of its eventual application, there is a pressing need to address some specific issues in telemedicine evaluation as soon as possible. These issues are largely based on the premise of telemedicine that has yet to be verified to policy makers and professionals in the field. The following is a discussion of these issues.

Since the barriers of distance and time exist for some portion of the American population, by virtue of their geographical relationship to health care providers, because of their own limitations of mobility to seek care, or as a consequence of institutionalization, a leading hypothesis posits that the implementation of telemedicine systems would provide a significant improvement in spatial and temporal access to care for many.

For those isolated for one reason or another from the contemporary medical care delivery system, there may be, with installation of telemedicine, a demonstrable improvement in the quality of the care available to them. The principal mechanism by which this can be achieved is the availability of consultation with specialists to remote physicians.

There is some evidence that the effects of telemedicine on the productivity of physicians can be significant.[6] The most effective use of telemedicine rests in its use with non-M.D. providers in remote settings and a central supervising physician. Thus, nurse practitioners and physician assistants can be used in remote sites for the provision of primary care appropriate to the level of their training and the needs of the clients. If accepted, non-M.D. providers can serve as a primary source of acceptance and identification with the telemedicine system and with the physician providing care over the television.[7] In this manner, the physician's time will be fully occupied, among multiple delivery sites, and at a level of performance commensurate with medical training. This "telemobility" may enable the physician to "deliver" care over a great distance and to a large number of different sites.

Particularly in the situation where accessible, high quality, and personal primary care has not been available before, a task for assessment of telemedicine will be the extent to which there are interactive effects among the expectations of clients and the abilities of providers and the system to meet them. Of particular importance are changes in the expectations of patients concerning accessibility to care, the quality of care rendered and their combined effect upon expectations of level and use of health services. First, there may be increased demand in the level and kinds of care to be available. Yet to be determined is the productive capacities of telemedicine systems. Particularly, given a configuration of telecommunications equipment, non-M.D. manpower, and supervising physicians, what are the levels and kinds of demands for health care services which can be met, at what level of quality?

Reduced distances and time to care may also have implications for the level of expectations of clients concerning other access factors. With reduced travel required, will patient expectations of reasonable waiting and service times be higher, with a subsequent reduction in overall acceptance of the system? At this point it appears that the length of time of a television encounter is longer than that conducted face-to-face.[8] Few telemedicine sites have, for reasons of costs primarily, more than one or two satellite sites. An important issue for evaluation is the effectiveness of telemedicine systems that have several satellite sites connected to a central coordinating source.

Related to patient expectations of the accessibility and quality of care received through telemedicine systems is the need for further research into the content of the interaction that occurs between the physician and the patient over the medium of telecommunications, such as telephone or television. Some work has been done on the analysis of the content of the telemedicine encounter, but much remains to be learned. Particularly, does a telemedicine encounter facilitate the patients' communication of the discomfort being felt, or does it reduce it? What is the effect of communicating instructions for medications or treatment? Is patient comprehension and compliance likely to be increased or decreased as a result of the medium of communication?

For the provider, faced with the increasing requirements to be abreast of technical knowledge and to utilize this knowledge in the treatment of patients, the facilitating aspects of telecommunications are not well understood. Does providing access to scheduled clinical conferences involving remote specialists in their field increase the likelihood that a physician will "attend" these presentations in order to keep abreast? In having the facility, via telecommunications, to consult on specific cases with remote specialists, will the physician's consultation and referral patterns change and how?

Further research is needed on the effects of telemedicine on the organizational structure and setting in which it is placed. What are the organizational consequences of the reallocation of diagnostic and treatment activities between the non-M.D. provider and the physician under telemedicine? Are problems of communication and control over the conduct of care heightened or reduced? Particularly important is whether, when interceded by a telecommunications system, the hierarchical relationships between a supervising physician and a remote non-M.D. provider are changed in any way. The organizational consequences of introducing new roles into medical care delivery, such as that of the technician who is at once part of and apart from the delivery of care, are imperfectly understood at this time. New roles are associated in turn, with questions concerning new task definitions and the manner in which these definitions are reached in a telemedicine setting.

*Acknowledgement. Grateful acknowledgement is made to Bethany Martin for typing the manuscript, to Michele Demak in preparing the graphs and to my colleague Joseph Lovett in sharing ideas about evaluation of telemedicine.

Footnotes

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[6] Doermann, A., et. al. Extending the Capabilities of Non-Physician Providers in Isolated Rural Areas: An Investigation of the Potential Impact of Telecommunications Based Technologies. (Washington D.C.: MITRE Corporation Report, Oct., 1975).

[7] There is strong evidence from the authors research on one telemedicine system that acceptance of a technologic innovation such as telemedicine is highly dependent upon the context in which it is presented and, moreso, on initial acceptance of the provider through whom it is introduced. See reference #3.

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Figure 1

Details of Comparative Structural Components

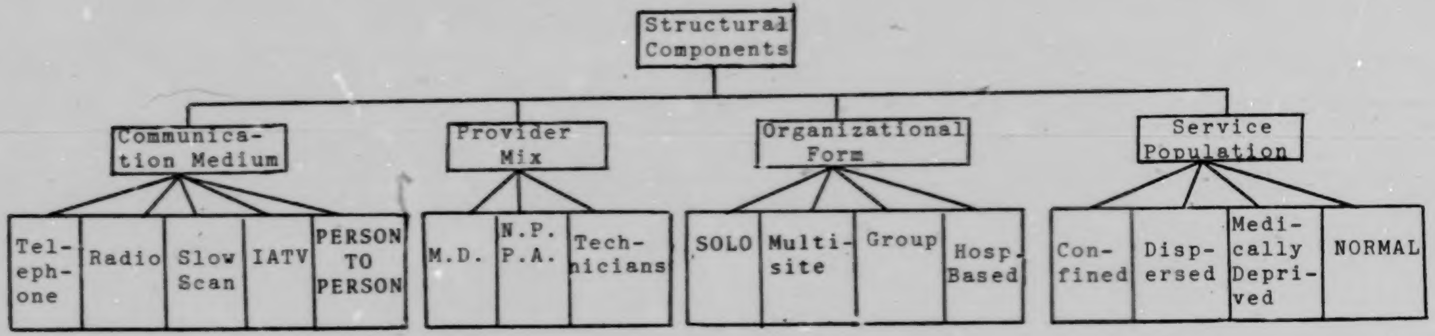
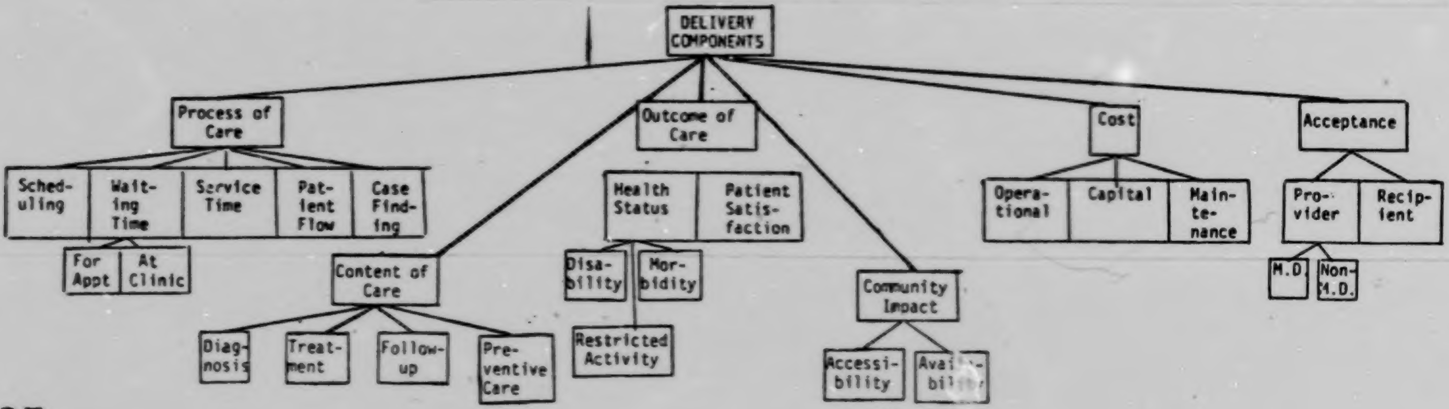

Structural Components
Communication Medium
Provider Mix
Organizational Form
Service Population
Telephone
Radio
Slow Scan
IATV
PERSON TO PERSON
M.D.
N.P. P.A.
Technicians
SOLO
Multisite
Group
Hosp. Based
Confined
Dispersed
Medically Deprived
NORMAL

Figure 2

DETAILS OF HEALTH CARE DELIVERY COMPONENTS


DELIVERY COMPONENTS
Process of Care
Outcome of Care
Cost
Acceptance
Scheduling
Waiting Time
Service Time
Patient Flow
Case Finding
For Appt
At Clinic
Content of Care
Diagnosis
Treatment
Follow-up
Preventive Care
Health Status
Patient Satisfaction
Disability
Morbidity
Restricted Activity
Community Impact
Accessibility
Availability
Operational
Capital
Maintenance
Provider
Recipient
M.D.
Non-M.D.

TELECONFERENCING IN CONTINUING HEALTH EDUCATION:
A SOUTH DAKOTA PERSPECTIVE

Alan G. Chute, Ph.D.
Assistant Professor
Educational Resources
School of Medicine
University of South Dakota

Ina J. Curtis
Administrative Assistant to
Chief of Staff
Royal C. Johnson
Veterans Memorial Hospital

Charles R. Rose
Director
Continuing Health Education
Health Affairs
University of South Dakota

Overview

Many of the health care providers in South Dakota are located great distances from major health care centers and medical teaching facilities. To reach these health providers with continuing health education programs and provide opportunities for professional interaction by traditional means, such as traveling specialists, is both costly and difficult because of geographic isolation.

In other states telecommunications technologies have demonstrated great potential for overcoming time and distance barriers to provide cost-effective quality continuing health education. In particular, the interactive audio medium of telephone teleconferencing has been shown to be as effective as face-to-face instruction.

A teleconferencing network in South Dakota will make it possible for any health professional to participate in continuing health education programming relevant to his or her particular needs. A network will also facilitate a substantial reduction in travel time and travel costs during a period when educators are being faced by increasing costs due to the energy situation.

The University of South Dakota School of Medicine has experimented with telephone teleconferencing for conducting continuing health education programs and is presently planning for the development of a teleconferencing network to meet the needs of South Dakota's health care providers.

Physician Population Distribution

Two major factors influence the amount of continuing health education programming in South Dakota--the number of physicians in the state and the physician population distribution. South Dakota has traditionally suffered from a shortage of physicians. In 1910 the ratio of physicians to population was 100:100,000.[1] Today there are 642 practicing physicians in the state; however, the state has essentially the same physician-to-population ratio as it had in 1910. The national average for physician-to-population ratio is 161 physicians for 100,000 people. The shortage of physicians in the state is due in large part to a sparse population and an agricultural-based economy.

South Dakota physicians tend to locate around the two largest urban areas in the state--Rapid City and Sioux Falls, resulting in a simultaneous reduction of the physician distribution in the rural and small communities; there are 13 counties which do not have physicians and 13 counties which have only one practicing physician.

Sixty-two percent of the South Dakota population reside beyond a thirty-mile radius of Rapid City and Sioux Falls; however, this area contains less than half of the state's total health care resources. See Figure 1. Only 49.7 percent of South Dakota physicians reside outside these areas. Eighty-seven percent of these physicians are in solo practice.[2] The high proportion of solo practice often limits the involvement of the physicians in continuing health education and other exchanges of medical information which would upgrade and renew their skills.

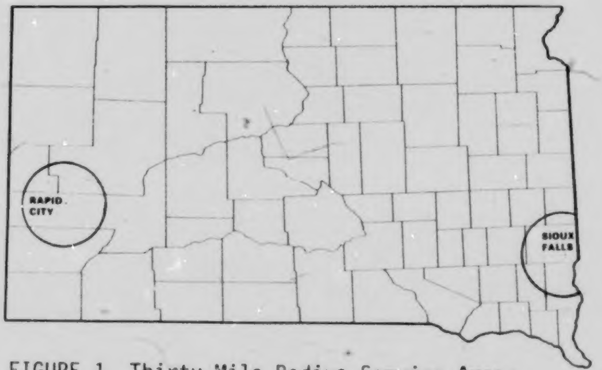


FIGURE 1. Thirty-Mile Radius Service Areas.

Geographic Situation

The state of South Dakota consists of 77,000 square miles inhabited by approximately 689,543 residents. This population is predominately white with a 5.8 percent Native American component comprised of 39,498 residents. The population is concentrated on the eastern and western borders of the state. The remainder of the state is very sparsely populated with densities dropping below one person per square mile in some counties. The 1978 per capita income level in the state was $6,864 compared with the national level of $7,836.

The state is roughly bisected by the Missouri River with substantially different geologic and economic characteristics on each side of the river. Eastern South Dakota is primarily a farming-based agricultural economy complemented with light manufacturing, wholesaling and retailing enterprises. Western South Dakota is more arid, relying upon livestock-based agricultural enterprises as well as some mineral industries and tourism in the Black Hills area. South Dakota is not served by any passenger rail lines and has marginal bus and airline services. Winter weather is often severe and a limiting factor to personal highway travel. The mean temperatures in the northeastern part of South Dakota for December, January, and February are 16, 10, and 14 degrees Fahrenheit respectively. The mean temperatures in the southwestern part of the state are 28, 24, and 26 degrees, respectively.

South Dakota is a prime target for the application of telecommunications technology. Its widely distributed population with low densities, severe climatic conditions, and lack of substantial wealth are all limiting factors which require an innovative and cost-effective approach to meeting health care education needs.

Goals and Objectives

A teleconferencing network for the exchange of medical information within South Dakota will address two major goals: to improve patient care by reducing the time lag between technological and medical developments and their direct application in South Dakota; and to facilitate the widest possible cooperation and consultation among health care professionals at the Veterans Administration Centers, at The University of South Dakota School of Medicine, in rural and urban communities and in other state and federal agencies which provide medical care for South Dakotans.

The objectives for the teleconferencing network will be: 1) to provide more health education programs to a wider variety of participants in the state of South Dakota; 2) to improve the cost-effectiveness of continuing health education delivery; and 3) to share and extend teaching resources in the state of South Dakota.

Teleconferencing Solution

A variety of alternative solutions were investigated to meet these goals and objectives for continuing health education in the state of South Dakota. Because of the many geographically isolated areas and the time and distance barriers to travel in this state, special consideration was given to telecommunication solutions. Telecommunications technologies have been shown to be as effective and in some cases more effective than traditional face-to-face instruction. Of these technologies telephone teleconferencing has been found to be one of the most cost-effective.

The University of South Dakota School of Medicine in cooperation with the Veterans Administration Centers and other state and federal health care agencies in South Dakota proposes to establish a teleconferencing network which will share existing health education resources within the state and extend an academic environment to health care providers in geographically isolated areas. This teleconferencing network would be instrumental in keeping South Dakota's health professionals current on technological and medical developments affecting patient care.

The telephone teleconferencing medium is a cost-effective educational delivery system because it can present current medical information simultaneously to large numbers of participants located in widely dispersed areas of the state. Health care providers could receive continuing education in the communities where they practice. Time, distance, and severe weather conditions limit continuing education delivery in South Dakota. A teleconferencing network which would be minimally influenced by these factors will increase continuing education opportunities for health care professionals in geographically isolated areas of the state, in National Health Service Corps clinics, in Indian Health Service facilities, in Veterans Administration Medical Centers, at the Ellsworth Air Force Base Hospital, and in other public and private health care centers.

The proposed telephone teleconferencing network will employ four-wire dedicated telephone circuits, dial-up circuits, and a conference bridge. In the teleconferencing network four-wire dedicated telephone circuits will be leased from the state telpack system. See Figure 2. These eleven key cities on the state's telpack system will be able to simultaneously share continuing education programming originating from any location. Furthermore, additional dial-up telephone lines will be bridged into the dedicated network to involve participants in even the smallest rural community. The dial-up telephone lines can also be used to connect prominent resource people outside the state and to share programs being offered by other medical education networks throughout the United States.

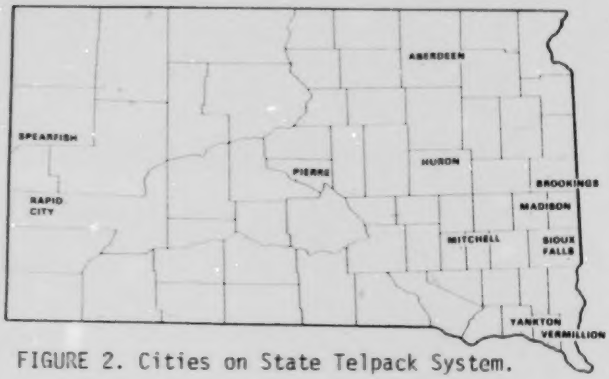


FIGURE 2. Cities on State Telpack System.

Feasibility

There are a number of required conditions that must be met to ensure the feasibility of the teleconferencing network. Among these is demand for services. To date, the School of Medicine Office of Continuing Health Education has conducted three pilot studies involving health professionals from the Veterans Administration Centers, the United States Air Force, the National Health Service Corps, the Indian Health Service, private practice, and The University of South Dakota School of Medicine. The professions represented included medicine, nursing, and a broad spectrum of allied health professions. The response of these participants was overwhelmingly positive. In every case they indicated that they felt that telephone teleconferencing is a viable education delivery system for health education and expressed a strong interest in participating in future programs.

The fundamental technical requirement of a teleconferencing network is the ability to reach the educational sites by telephone. This service is available throughout the state of South Dakota either by Northwestern Bell services, by local telephone companies, or by the state's telpack circuits. The pilot projects involved interface between Northwestern Bell lines, independent telephone company lines, and the state's telpack lines with excellent results. Further, there is no site in the state of South Dakota where a health professional practices that is not accessible by telephone.

Innovative Applications

The teleconferencing network will have two major innovative aspects. The first is its orientation toward comprehensive sharing of resources and services. The network will be available to all health care programs functioning in South Dakota, including federal, state, and local agencies. The network will cooperatively involve The University of South Dakota, Area Health Education Centers, Veterans Administration Centers, Indian Health Service, Ellsworth Air Force Base Hospital, National Health Service Corps, and other interested health care organizations to jointly sponsor critically needed health education programs at relatively low cost. These agencies will share resources faculty on the network; moreover, the teleconferencing network will be willing to share its resources with other states that have developed teleconferencing networks.

Secondly, the network incorporates an innovative delivery medium which provides interaction between participants at geographically remote sites. This medium has not been developed to its full potential, particularly in the state of South Dakota. The major categories of usage will be telelecturing, teletutoring, administrative teleconferencing, and information transmission.[3]

Telelecture is a popular teleconferencing format for physicians, nurses, and allied health professionals. These clientele groups are accustomed to receiving information in a format which permits large numbers of facts, new information, or reviews of material to be presented in a short period of time. Telelecture can be reinforced in many ways by supplementing the verbal information with visual materials. Prior to programs the participants may receive welcome letters from instructors and skeleton outlines so that they can follow a lecture easily and take notes. Visuals may be incorporated in the outlines and other handout materials. Study question lists, bibliographies, and additional reference materials have been found to be useful for participants who want to follow up the content presented in the telelecture.

Teletutoring enables students by means of a telephone to contact their instructors for individual support in their study work. The student studies independently with the help of pre-produced study materials such as correspondence packets, filmstrips, or audio or video cassette program packages. The instructor calls the student or the student calls the instructor and they discuss the work in the correspondence package. Teletutoring has widespread application for South Dakota health care providers. It can be used to meet the continuing education needs of isolated physicians assistants, nurse practitioners, physicians, and emergency medical technicians in remote areas of the state. The use of correspondence material and a telephone answering system enhances the capability of a teletutoring program.

Administrative teleconferencing is a way to bring together decision-makers frequently to act on administrative issues. At a time when it is necessary to have quick communications and to develop mutual trust, it is both financially and logistically impossible to bring a large staff together often. One of the greatest benefits of teleconferencing is the saving of both the cost and time of travel. In a state such as South Dakota most of the working day can be consumed by travel to attend a conventional staff meeting which itself might be of relatively short duration. Despite rising cost of travel in an inflationary period, a far greater cost is the cost in salaries of staff while traveling to and from meetings. Administrative teleconferencing shows great promise for coordinating activities and breaking the time and distance barriers.

Information transmission can be efficiently accomplished with a dedicated four-wire teleconferencing network. Audio information such as announcements, program schedules, schedule changes, administrative notes, and daily updates can be exchanged among any of the sites on the dedicated network. This form of electronic administrative communication can save a considerable amount of money for postage, duplication, and secretarial time. The information could be transmitted, using an audio tape recording of the administrative notes. This recording would be transmitted over the network at predetermined times. Following the transmission of the administrative notes the program coordinators at each location would be present to discuss any points that need further consideration.

These four major categories of usage--telelecturing, teletutoring, administrative teleconferencing, and information transmission--are innovative methods of information exchange for a sparsely populated, large rural state. Under the current economic climate with increasing restrictions on educational and administrative travel, an electronic exchange of information network could become a fundamental part of the health education delivery system in the state of South Dakota.

Summary

South Dakota is a prime target for the development of a teleconferencing network for continuing health education. Its widely distributed population with low densities, large number of health care providers in geographically isolated settings, severe climate conditions, and lack of substantial wealth are all limiting factors which require an innovative and cost-effective approach to meeting the state's health care education needs.

A teleconferencing network in South Dakota will make it possible for any health professional to participate in continuing health education programs in the community in which he or she practices. A network will also facilitate a substantial reduction in student and faculty travel time and travel costs during a period when continuing education expenditures are being closely scrutinized. And finally, a teleconferencing network will facilitate sharing of the existing health education resources within the state among local, state, and federal health education organizations.

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A TELEHEALTH EXPERIMENT IN THE BAFFIN ISLAND ZONE

David L. Martin
Department of National Health and Welfare
Ottawa, Ontario

Preamble

Communications in isolated communities, even within the health field, serve many purposes, clients and deliver many products (Figure 1). In Canada's far north, health care is primarily delivered by small teams of nurses (two or three) assisted by native health aides and helpers. The nurses are otherwise geographically isolated from medical expertise and guidance, educational opportunities, administrative support and social contacts with families, friends and peers.

Turnover has been high, the assumption being that the stresses brought about by this isolation are a major factor. Also, concern has been expressed that native peoples should receive the highest level of health care feasible. Obviously, it would be uneconomic to station a physician in each small community, and although physicians do make "rounds" of the villages, these cannot substitute for continuous coverage. The travel time would be an extremely inefficient use of these resources. Therefore, stress has been laid on the need to provide good communications capabilities between on-site nurses and centrally located physicians.

Until relatively recently, communications capabilities in the north have been poor, limited in many instances to radiotelephones which are subject to frequent outages due to ionopheric conditions. Telecommunications satellites made more reliable communications feasible, but relatively few circuits were provided initially. Those circuits quickly became severely overloaded and insufficient for medical needs. The only alternative appeared to be the leasing by Health and Welfare Canada of a dedicated channel with a single line to reduce costs.

Background

For many years health officials have been concerned about the communications capabilities of nursing stations in the far north. A joint study was undertaken by officials of the Department of National Health and Welfare and the Department of Communications, in the Baffin Island Zone, and reported in June, 1977. They recommended that:

"1. telecommunications be fully integrated with the health care system as an instrument of health care delivery in the Baffin Zone,

2. a 24-hour high quality communication system be made available in the Baffin Zone, specifically designed to meet the needs of the Health Care Delivery System,

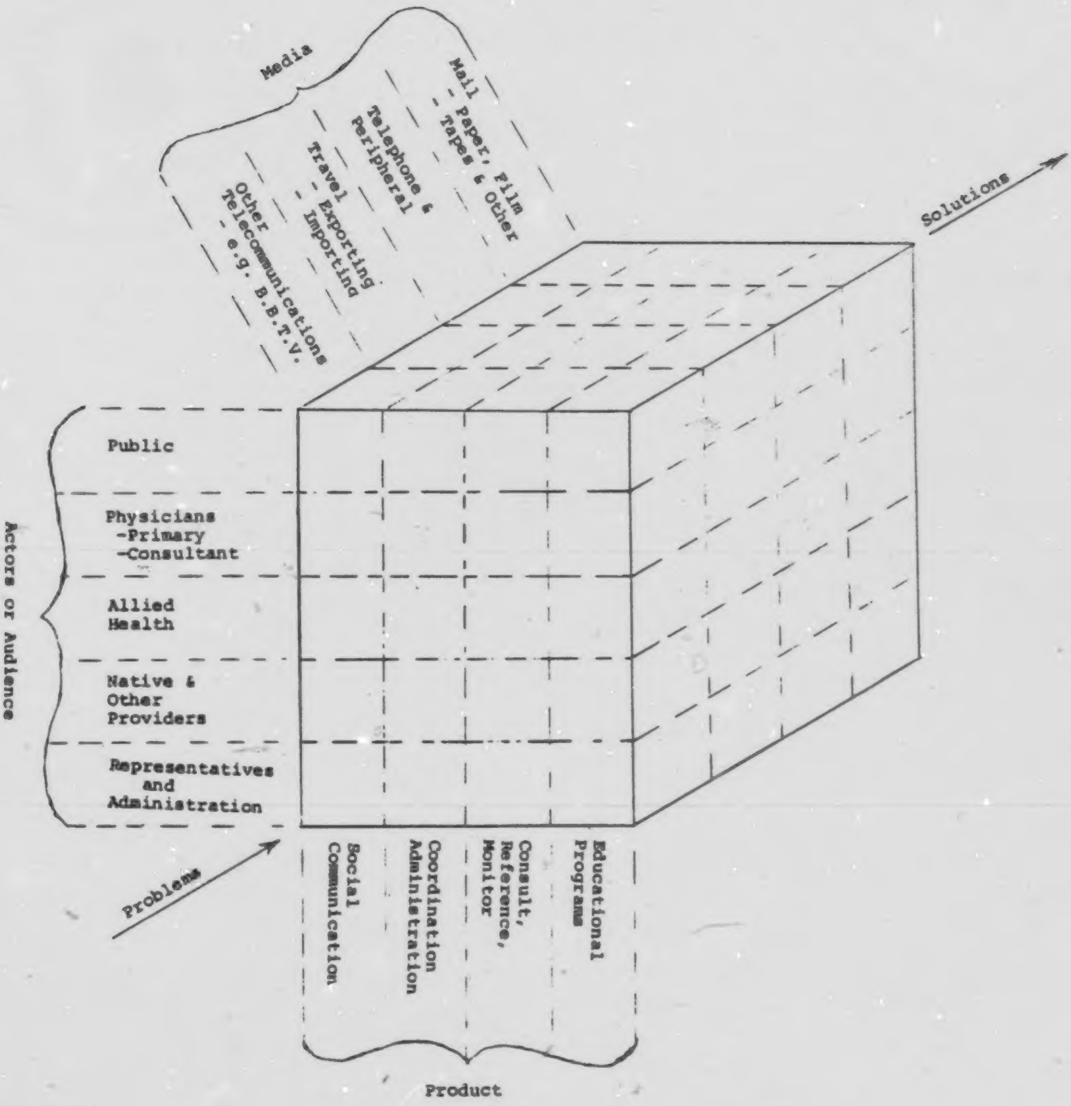
3. a pilot project be undertaken in the Baffin Zone, utilizing present satellite facilities, to fully explore and directly assess the various potential characteristics of a system with a design such as proposed in recommendation number 2, and

4. auxilliary uses of telecommunications serving the total health field in the Baffin Zone (with potential applications for other remote areas), be fully explored and assessed."

In March, 1977, Bell Canada offered to undertake a three month pilot study of improved communications for remote regions, including the installation of an experimental dedicated conferencing arrangement using the facilities of the Anik A communications satellite and hooked up on the party line principle.

Figure 1

A CONCEPTUAL MODEL
OF COMMUNICATIONS APPLICATIONS


Media
Mail
- Paper, Film
- Tapes & Other
Telephone &
Peripheral
Travel
- Exporting
- Importing
Other
Telecommunications
- e.g. B.B.T.V.
Solutions
Actors or Audience
Public
Physicians
-Primary
-Consultant
Allied
Health
Native &
Other
Providers
Representatives
and
Administration
Problems
Social
Communication
Coordination
Administration
Consult,
Reference,
Monitor
Educational
Programs
Product

Note: Combinations are possible in all cases

All locations would operate on a common transmit and receive frequency with voice activated equipment, using digital transmission techniques. It was admitted by Bell at the time, however, "some equipment, most operating techniques, and the cost effectiveness, still remain to be proven". (Technical Details in Appendix A).

Setting up the Experiment

A number of steps to establish the experiment were undertaken by Health and Welfare and Bell Canada officials, including:

1. telephone conferences between Bell Canada, Health and Welfare and Baffin Island Zone representatives to select the experimental and control stations,
2. visits to all experimental and control stations and the Frobisher Bay General Hospital by representatives of the TransCanada Telephone System and Health and Welfare Canada, to introduce the experiment to the personnel involved and to discuss the logging of telephone calls and post-experiment evaluation,
3. the design of a telephone log and an evaluation instrument, both distributed early to give notice of the questions which would be used in the post-experiment evaluation interviews,
4. the installation of the equipment, in September, 1978, and
5. daily calls to experimental stations to test the experimental system

Observations

The equipment behaved much differently than expected, and as a result the nursing station and hospital personnel behaved much differently than expected. First, the experimental system did not replace the use of regular telephones in the experimental stations. This was due to a number of factors:

1. The system was considered to be "frequently down", so that if the nurses tried it and were not sure that it was working, or if they had an emergency they switched to the more reliable regular telephone system. The nurses and physicians were not able to hear a ringing sound to indicate that the telephone was ringing at the other end. Faced with a "dead line", they were totally unsure of whether the system was working, or whether the person at the other end was away from his or her telephone.
2. The experimental phone, due to the sensitivity of the voice-actuated switching mechanisms, was subject to frequent interruptions during conversations, of from a fraction of a second up to two seconds, depending on room noises, noises on the line, or how the receiver of information was reacting to it. Any voice or noise interjection would cause both ends of the telephone system to be put into an "up" mode, and thus the system would be completely dead. With frequent breaks in the conversation, when potential users felt that much detailed information had to be given, they felt that they could not use the experimental system. Even a simple affirmative reaction of "uh-huh" would cause a break in the transmission. Spontaneous conversation was impossible, and heated debate even more so. In some cases radiotelephone techniques ("over") were used to try to circumvent this.
3. The third major limitation to the system was a restriction on the number of phone sets available, particularly at Frobisher. The system did not reach the hospital switchboard, the pharmacist, the stores manager or the physicians' homes. The nurse would have to reach these parties using ordinary lines.
4. The telecopiers similarly failed. Frequently the parties ended up reading the information over the telephone after trying to transmit it.

For these reasons, it is apparent that the nursing station personnel did not regard the experimental equipment as dependable. Therefore, many of the calls between the experimental nursing stations and the Frobisher Bay General Hospital went via the regular telephone lines. While the nursing station personnel reported that they felt an obligation to try to use the experimental system first, every time, in order to save on long distance bills, the frequency and timing of use of the regular system in the experimental stations is remarkable: on first inspection there appears to be a steady flow of calls on the regular system throughout the experimental period.

Figure 2 illustrates the purpose of the calls as logged by control and experimental stations during the experimental period, expressed as numbers of calls per 1000 population. Immediately notable is the large number of calls for administrative purposes, as opposed to calls for consultation or social purposes. There is little difference between the experimental and control groups in terms of aggregated administrative calls. For specific administrative calls, the differences in numbers may have been in part due to occurrences at the time of the survey. While the number of calls for consultative services appears to be much lower for the experimental stations than control stations, the difference cannot be regarded as significant. Within the consultation area, patient report calls were much higher for the experimental stations. This may have been due to the relative ease experienced by the patient care coordinator with the system, particularly to Arctic Bay.

Figures 3 and 4 illustrate the relative success rates and duration of calls and the proportion of calls which were made for emergency purposes. The reception quality was rated "good" more frequently by the nurses in the control group than by those in the experimental group. In addition, the proportion of calls rated "good" by the experimental stations is probably overweighted because of the tendency to judge each call on the basis of reception quality only without reflecting the other irregularities of the experimental system (e.g. "good but breaks in conversation" was simply counted as "good"). The distribution of duration of calls illustrates that a greater proportion of experimental system calls were of shorter duration. The control stations' experience of a much higher number of calls per 1000 population recorded as being of an emergency nature cannot be regarded as significant.

The duration of calls on the experimental system was shorter than for the control stations (Figure 5). Even when the experimental stations resorted to the regular lines their calls were shorter than the control stations for the experimental periods, and shorter than all stations from the historical data. Normally the nursing stations accumulate a number of items that they wish to discuss, and the calls are referred to various points in the hospital in order to avoid repeated calls with their perceived minimum charges. Conversely, when the nursing stations were equipped with the dedicated line, nursing station or hospital personnel would feel more free to pick up the experimental phone whenever they had something to discuss, rather than accumulating a "want list" of items. Thus, to some extent the parties in the experimental system did change their patterns of behaviour, adopting more frequent, shorter calls when "minimum costs" were felt to be no longer applicable.

When interviewed, participants' reactions ranged from mild support to near hostility towards the experimental system. The potential capability of picking up a telephone and contacting a station in the system by simply dialing two digits was well received. On the other hand, the intermittent nature of the telephones and reported frequent breakdowns in the system were causes of frustration.

The facsimile copier was also noted as a "disaster". At no time could any copy be transmitted between the nursing stations. One worked only a few times to the base hospital, usually after several tries. Finally the personnel gave it up entirely.

Only in a few instances did any of the parties interviewed pick up a phone to find that the line was busy. In this case, they would return the phone to the hook and wait a few minutes and try again. At no time did anyone try to preempt the line for an emergency during the experimental period. Other curious technical problems occurred within the system, some of which are listed in Appendix B.

In summary, this experiment illustrated:

1. the almost overwhelming need for telephone service for administrative purposes,

2. some change in call behaviour, with more frequent, shorter calls associated with those stations on

Figure 2: Utilization of Telephone, by Purpose of Call

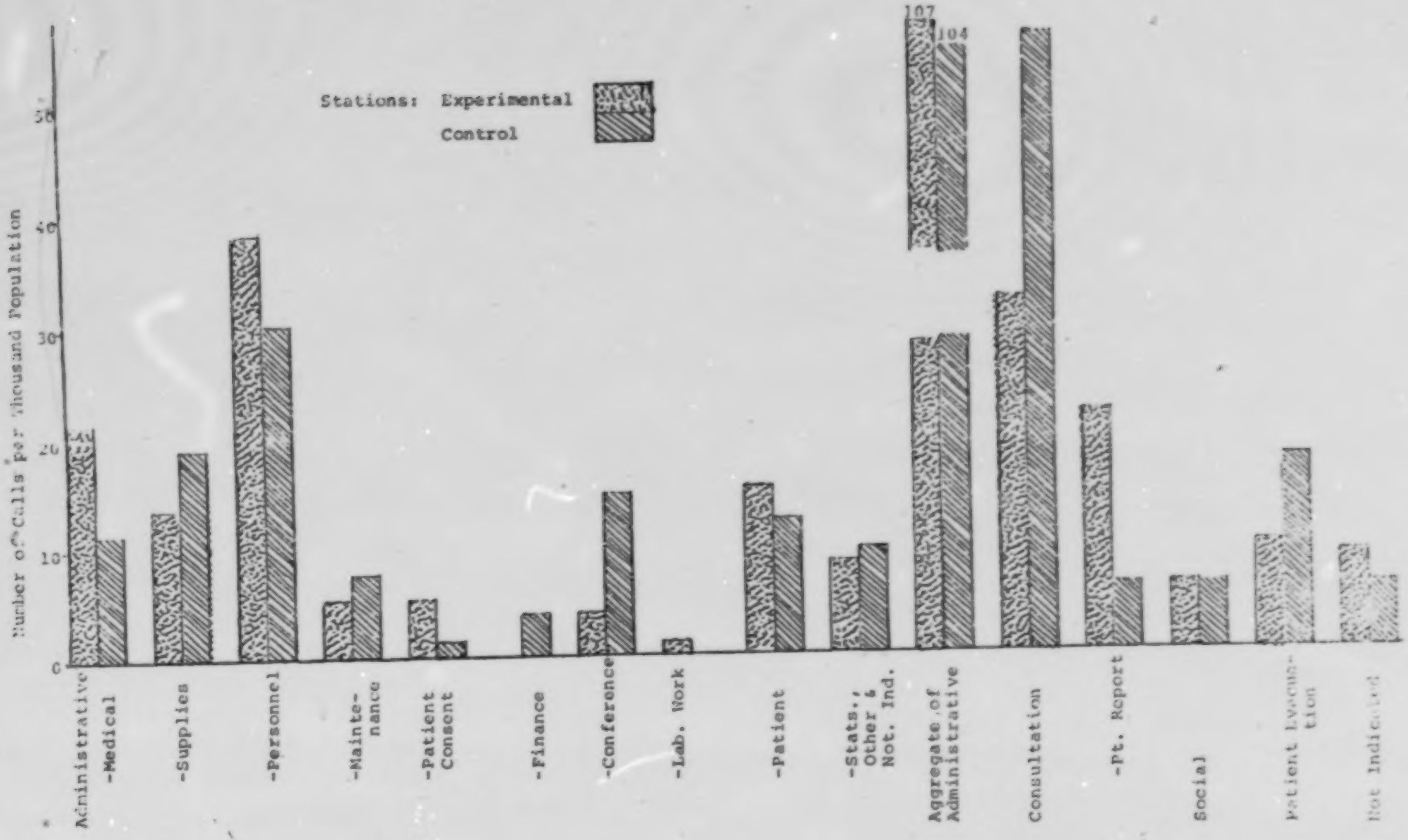


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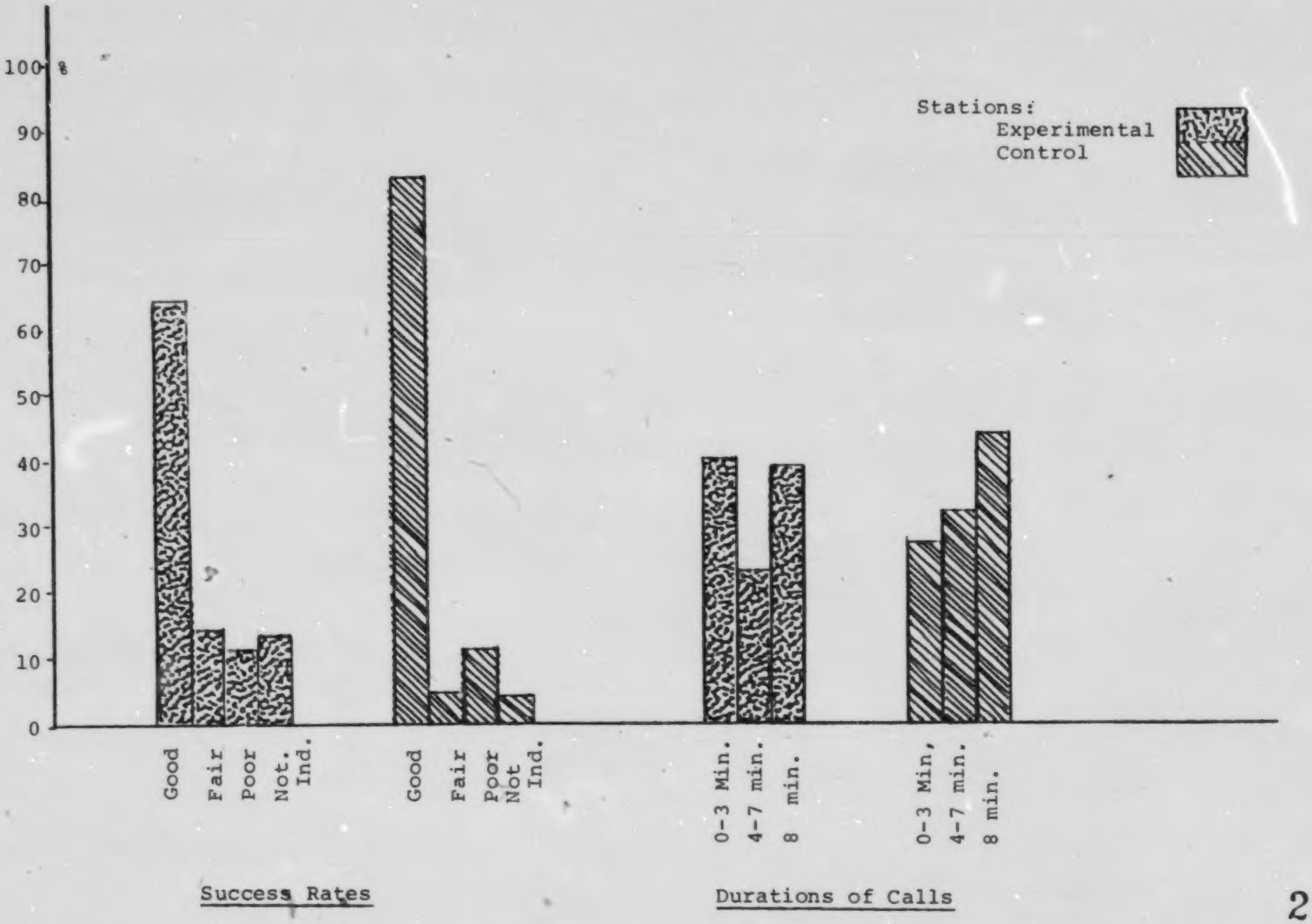
Figure 3: Success Rates and Durations as Percentages of Calls



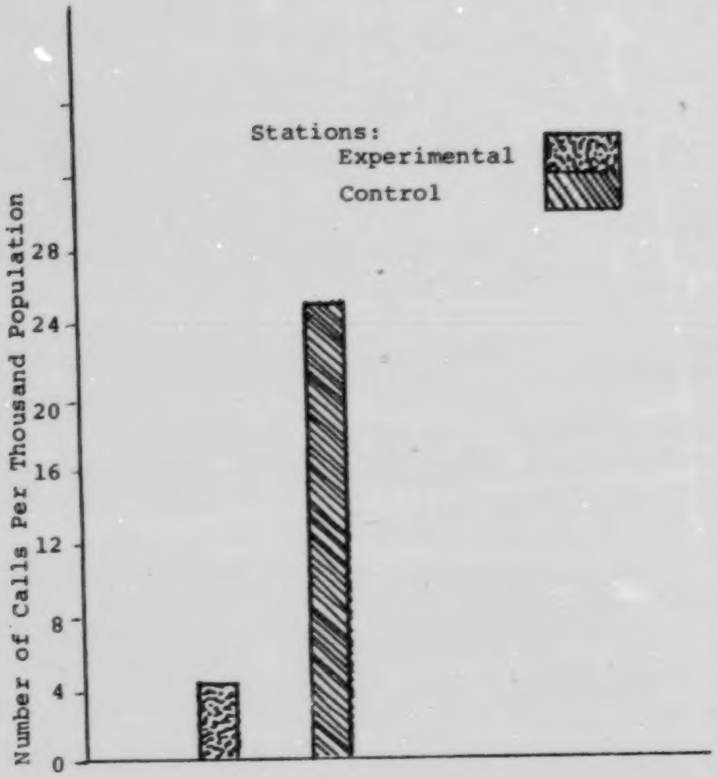


Figure 4: Emergency Calls per Thousand Population

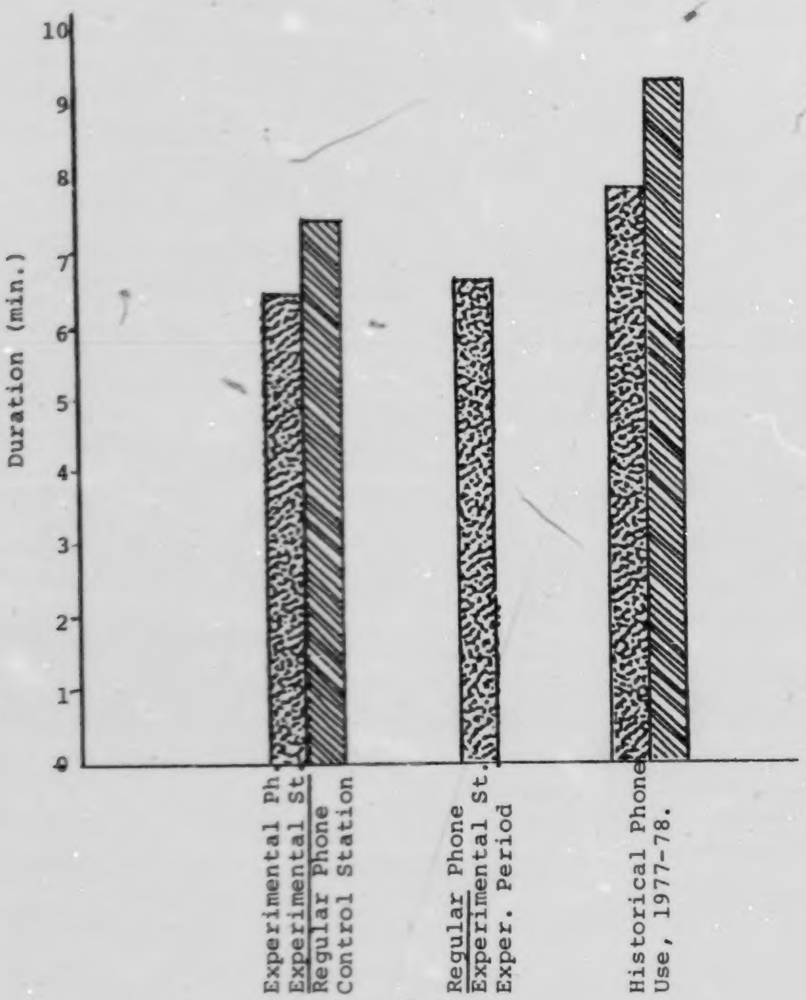


Figure 5: Average Duration of Calls

the dedicated system,

3. dissatisfaction with the experimental system, both because it was not possible to tell if it was operational, and because of the frequent interruptions in conversation due to the voice actuated nature of the equipment,

4. no changes in the social contact behaviour within the experimental system, (In both systems the social contacts were to points outside the system.)

5. appreciation for the lesser "hassle" to place a call by dialling two digits, (Otherwise the experimental system was felt to be technically inferior to the standard Bell circuits.)

6. the apparent inability of Bell Canada's experimental system to behave in an effective manner, as described in their proposal, and

7. the difficulty of establishing reliable telecopying in the experimental system.

Discussion

A previous simulation study indicated that similar dedicated line connections for all stations in the Baffin Zone would cost $140,000 to $160,000 per year. On the other hand, the historical costs of long distance telephone charges within the zone amounted to $16,815. Thus, in order to determine whether a dedicated system was justifiable, one would have to predict a real need for telephone communications of about 10 times the present long distance utilization. Obviously, this leap in need or demand did not occur during the experimental period. In fact, the nurses in the nursing stations reported that they already had the privilege to contact Frobisher Bay and other parts of the system when they deemed it appropriate. They tempered their demands on the system, by accumulating "want lists" as noted above, so that their calls might be shifted from local to local within Frobisher when they contacted Frobisher Bay, thus reducing the number of calls to Frobisher Bay.

Transmitted documentation would have been useful in some cases, particularly for consent and for documentation of "casual" personnel. It was felt that routine administrative announcements could be sent via mail in any case. However, the two low cost portable facsimile machines tried in this experiment proved to be unsatisfactory, particularly for satellite handled communications. It would appear that these have not yet adopted a workable "hand shake" technical protocol.

It appears that the single line voice actuated system is not suitable to this environment. There were too many breaks in conversation, and, while push-to-talk microphones might be useful to get around this, radiophone protocol would be necessary, thus restricting spontaneity in conversations. A multipoint private line system on a single satellite requires push-to-talk equipment; otherwise, a separate satellite circuit must be used for each served location with bridging at an earth location.

The isolated or dedicated system for nursing stations is not indicated from a maintenance standpoint. If the system breaks down, recourse would have to be made to normal channels. A considerable time lapse could take place before maintenance crews could correct the problems, due to distances and weather factors in the north. More telephone channels appear to be the more feasible solution for the remote communities. Also, the installation of direct distance dialing into each community would be a great asset, to reduce the delays of going through the operator.

The conference arrangements were rarely used in this system because of the sensitivity of the conferencing apparatus. On the other hand, conference calls have yet to be adequately tested.

The fact that there appeared to be no change in social demands on the system, and the large number of social calls outside of the system indicate that social attachments for the nurses are more likely to be outside the system. However, it should be pointed out that because of personalities, other stations might experience a greater need for social connections to their neighbouring stations. (In the experimental stations, the turnover has historically been very low.)

Nurses may rarely see one another, and then only for relatively short periods. There may be little incentive or opportunity to form attachments with other nurses in the Frobisher Zone. Young graduate nurses, of course, have all of their attachments to their home towns if they are from Canada, whereas the "pull" may be less strong for the nurses who have come from outside Canada. Interpersonal knowledge begets social calls, and not vice versa.

The data also indicate several aspects of "isolation" that had not been previously suspected:

1. Supplies, services and financial support are probably of greater importance to the isolated nurses than previously envisaged, possibly even more important than medical consultation. For years northern nurses operated in total isolation - made whatever decisions were necessary and coped with medical emergencies as best they could - evacuating whenever they felt it advisable (and it was not always possible) and otherwise intervening themselves. They received additional training for this before they went north, and then depended upon their own resources and whatever reference material was available.

2. Social isolation is most keenly felt from family and friends, not from peers and superiors (e.g. physicians).

3. Although some discussion took place regarding the possibility of mounting an education program on the system, it was never done - nor was it requested. For the work they do, the nurses may feel that the most relevant educational experience is the competent consultation - which should be primarily educational. Other instances have occurred that show that the nurses are quite capable of and eager to "carry the ball" once they have sufficient knowledge of how to recognize and deal with specific medical problems.

Thus, priorities for understanding the elements of isolation and their relative importance may have to be altered to meet more basic needs: social ties to family and friends and basic logistical support.

Thus there appears to be no evidence that the demands will ever grow to the point where a dedicated system is indicated. However, a few improvements could be investigated, such as:

1. hospital extensions to the physicians' homes,

2. a "conference bridge" in Frobisher Bay when better circuits are available to the remote communities, and

3. facsimile machines over the regular lines, when newer technology for facsimile machines improves their compatability with the Bell Canada satellite system.

Conclusions and Recommendations

While a dedicated circuit has a number of advantages, the requirement that phone use patterns be altered significantly and the fact that there is not a significantly greater need for the telephone than has been historically demonstrated would indicate that a dedicated system is not to be recommended. There would also appear to be no major social advantages to a dedicated system. A dedicated circuit has the disadvantage of a lack of backup in breakdown situations, and delays in obtaining maintenance assistance at outpost locations. Similarly, a single line system is not recommended due to its other technical idiosyncracies. The more appropriate answer would appear to be to add more circuits for the outlying communities.

Epilogue

While the experimental system had a negative impact, useful data was obtained for both technical and program considerations. More circuits are being installed in northern communities, relieving the congestion and thus solving health practitioners' problems of circuit availability. The "dedicated channel" consideration has been put to rest, from an economic and from a maintenance point of view. For the more distant future, plans are being drawn up to extend Direct Distance Dialling service to northern comnuties, at which time a "conference bridge" at the base hospital could become practical.

Appendix A

Circuit System Technical Specifications

Multi-Point Private Line service employing a Selective Signalling (Wescom SS-1) System, with single voice-activated satellite channel (to save transponder capacity), with 4-wire to 2-wire hybrids at each location for facsimile and hands-free telephone service.

Voice Operated Relay

Wescom VOX

Telephone Units

Hands-free Companion II

Telecopier

3M, Infofax

Appendix B

Technical Problems in System Listed By Bell Canada (Other Than Equipment Breakdowns)

1. Noise and Cross-talk in Bell VHF radio link cables much more severe than expected. Also, significant grounding problems in north.
2. Customer acceptance of rigid protocol required by voice-activated system.
3. Problems of supply, installation and maintenance due to isolation, distances and frequent severe weather.
4. Incompatibility of telecopier units with satellite circuit configurations, including transmission delays and carrier control.
5. Lack of ringing indication to the calling party disturbing if call not completed.
6. Hands-free Companion II too sensitive for voice activated channel.
7. Voice operated relay (VOX) does not have required time delay range to match satellite transmission delay.

MIXING TELECONFERENCE AND VIDEOTAPE FOR INTER-UNIVERSITY INSTRUCTION

George J. Vesprani
Project Director
UAF Consortium Media Project
Cincinnati Center for Developmental Disorders
University of Cincinnati

William C. Veatch
Chairman
Central Conference Media Exchange Committee
Cincinnati Center for Developmental Disorders
University of Cincinnati

When the Central Conference was founded in 1969, the major goals were to find new ways to facilitate the development of training programs and materials for mutual use and benefit. The reader should realize that the Conference came into being because the directors of a small number of university affiliated training programs within a multi-state region recognized the limitations of their own economic and faculty resources. Their common thrust was to provide training for professionals who would work in the field of mental retardation and other developmental disabilities. Within that basic framework, however, each training program developed along its own unique path; each attempting to find its way within the constraints of its own environment. A group of directors representing these programs initially exchanged letters of inquiry and later pursued a series of exploratory meetings which rotated between the university campuses on which the programs were located. These early meetings allowed for the visitation of facilities, for involvement of staff at each location, and for extensive informational exchange. Emerging from these meetings was a desire to maintain contact enhance communication, share ideas, but most of all, to find ways to capitalize on the expertise and unique individual resources through some cooperative effort.

Exchange of faculty and students was considered but rejected because of problems inherent to this process. Many problems in this area seemed insurmountable, including those posed by differing academic calendars, expenses related to travel, and basic costs of providing housing if the faculty or student exchange lasted for an extended time period. Exchange of faculty as speakers and guest lecturers was agreed to and carried out successfully, but the impact was limited. How to reach large numbers of students, enhance communication, share expertise and perhaps at the same time produce a tangible product for use in training was the problem begging for a solution.

Phase One

What evolved was the idea of developing and sending a series of mediated informational packages between all participating training programs. Each training program was to produce a simple slide/tape or videotape that highlighted some aspect of its functioning. These informational packages were then presented at each locale on a prearranged weekly rotating basis until everyone saw the entire series. The format of the mediated informational packages was optional and depended on production capabilities at each locale. In fact, only one package was produced in slide/tape format while the others were produced in 1" black and white videotape. Content was determined by the individual training program with no effort being made to coordinate or unify a particular content area. Evaluation was by means of attendance records and simple questionnaire directed at the process elements of what became known as the "Media Exchange Series". One added feature of Phase One was the attempt to unify the simultaneous presentation of one videotape at all locations with a conference telephone call to discuss the implications of the program content and to allow for direct questions to the producer. This latter element, which in retrospect did not work very well from a technical point of view, sparked a sense of immediacy and presence that the participants could not readily forget. The interconnection so enthused the entire group that they demanded via their responses on the evaluation questionnaire, that the conference call element be included in all future Media Exchange efforts.

There were many difficulties that had to be met and solved in Phase One and many lessons were learned. The most perplexing, perhaps, involved the shipment and rotation of informational packages. Because one presentation site was in Ontario, Canada, the materials had to pass through Canadian customs with accompa-

SCHEMA OF DEVELOPMENTAL PHASES

PHASE	PROGRAMMATIC FEATURES								ORGANIZATION AND PLANNING		
	PRESENTATION FORMAT	PRESENTATION LENGTH	TELEPHONE EQUIPMENT	CONFERENCE SET-UP	CONFERENCE MODERATOR	EVALUATION	CONTENT CONTROL	PRINT MATERIALS	USE OF COMMITTEE	USE OF CONFERENCE CALL FOR PLANNING	USE OF DIRECT FACE-TO-FACE MEETINGS
I 1973	SLIDETAPE & 1" B+W VIDEOTAPE	VARIABLE TO ONE HOUR	SPEAKER PHONE	CINCINNATI BELL	NONE	PROCESS ONLY	NONE	NONE	NONE	NONE	NONE
II 1975	1" B+W VIDEOTAPE 1/2" B+W VIDEOTAPE	↓	SPEAKER PHONE	↓	RESPONSIBILITY OF PRESENTOR	↓	UMBRELLA TOPIC ONLY	ONE PAGE SUPPLEMENT FOR EACH PRESENTATION	LIMITED TWO PERSON	NONE	NONE
III 1976 - 1977	MIXED B+W OR COLOR FORMATS	↓	SPEAKER PHONE AND CONFERENCE PHONE	MICHIGAN BELL	DESIGNATED MODERATOR	↓	UMBRELLA TOPIC AND SPECIFIC SUB-TOPIC	EXPANDED SUPPLEMENT AND OVERALL PROGRAM	EXPANDED COMMITTEE AND REPRESENTATIVES	LIMITED USE (UP TO 3 CALLS)	INCIDENTAL SUB-GROUP MEETINGS - NO TOTAL GROUP
IV 1978	3/4" VIDEO-CASSETTE B+W OR COLOR	VARIABLE TO 1/2 HOUR	CONFERENCE PHONE (50A)	CINCINNATI BELL	↓	↓	↓	↓	↓	EXPANDED USE (4-6 CALLS)	INCIDENTAL SUB GROUP MEETINGS ALL DAY PLANNING MEETINGS CONSULTATION WITH MEDIA SPECIALIST
V 1979 - 1980	↓	20-30 MINUTES	↓	DAROME	↓	PROCESS AND CONTENT	ASSIGNED SUB-TOPICS	OVERALL PROGRAM 4-6 PAGE SUPPLEMENT OVERVIEWS	EXPANDED COMMITTEE REPRESENTATIVES CONSULTANTS	↓	↓

nying delays and additional costs. A second difficulty involved technical elements of the conference telephone call. Each locale had to install a speaker phone system in a classroom or meeting room, incurring rental and installation costs for but one session, and lastly, no one at any locale had sufficient familiarity with teleconferencing to prescribe any format or protocol Our naivete during Phase One and the problems we met did not dampen our enthusiasm for this new venture, it only spurred us to experiment and push deeper into unknown territory

Phase Two

Phase Two did not emerge until two years later. Although it was decided to produce the Media Exchange Series on an annual basis, even this limited demand on manpower and support services proved overwhelming. One must consider that many of the training programs had no instructional technology staff nor did they have ready access to the necessary production facilities. These problems delayed the next annual Media Exchange Series until 1975 at which time some of the training-programs either acquired the necessary staff or made contractual arrangements to use existing production facilities within their university community. The net result of this, however, was that all parties shared more or less equally in the costs of producing these materials. All were equal partners in an exciting new enterprise.

It was recognized that some organizational effort was needed well in advance of the actual presentation dates. No longer was the group satisfied with a simple rotation of materials but, by committee, a decision was made to provide sufficient informational packages for simultaneous presentation at all locales, each presentation to be accompanied by a conference telephone call. Planning, too, was to use the conference call technique along with individual calls and letters between committee members. In response to comments on the evaluation questionnaire, simple written materials were developed by each producer to accompany their videotape. In most instances, this consisted of 1 page of typewritten information about the tape content and perhaps a few references. These written materials were duplicated at each locale and distributed to the audience at that site. Once again, content was solely determined by the individual producer. It was decided, however, that the content should emphasize moral, ethical and legal issues as they affect the developmentally disabled person. This was the first attempt to organize program content around a unifying theme. The need for a unifying theme became apparent as the group discussed the needs, the weaknesses, and the assets of their individual training efforts. No single training program was strong in these areas nor was there the likelihood that they, on an individual basis, could build such expertise into their efforts. This theme allowed all of them to provide a unified focus on this area, solicit and obtain consultants on a time limited basis and at the same time examine their own and their communities' resources in that context.

Format and length of videotape varied which provided numerous problems with regard to necessary playback equipment and timing of the conference telephone call. The quality of the videotapes themselves also varied widely. Speaker phones were used again and proved to be adequate but not well-suited to the size of the audience or the number of sites involved. Many technical problems involving organization, interconnection, and telephone sound quality existed that served to weaken the effectiveness of the discussions. The Media Exchange Series during Phase Two, in spite of its technical difficulties, proved a continued success and planning for the next Media Exchange Series was begun shortly thereafter.

It should be emphasized that the technologies employed up to this point were readily available, not terribly sophisticated nor expensive. It was the mix of videotape material with some simple written material and a conference telephone call element that made the annual effort work. As the participating training programs gathered experience and as their expertise grew, the whole process became more sophisticated. At this stage of the process, each producing training program paid for the costs of its own videotape, duplication and distribution of videotape and print materials as well as for the conference telephone call that accompanied its presentation. Thus, while the costs were distributed more or less equally, the Central Conference itself bore the cost of the planning conference telephone calls.

Phase Two of the Media Exchange Series (1975) contributed only minor modifications in structure or format. The evaluation questionnaire was gradually modified to focus more sharply on fewer, though more critical, elements of the process. Repeated attempts to settle on a single tape format were unsuccessful because of limited equipment availability, necessitating duplication of tapes in various formats. The group, however, had begun to generate most of its tapes in 3/4" videocassette format. During this phase, the need for a local moderator was recognized. It was, up to this point, the responsibility of the local producer to identify a person to chair the discussion for their own presentation. But what emerged from this was a rotating series of moderators who the audience could not identify on any continuing basis. There was no central or controlling influence to direct and guide the discussions to aurally tie each program to those that followed. The audience had no touchstone to provide continuity. These elements were given concerted attention in the next developmental phase.

Phase Three

Phase Three (1976-1977) represented a large step forward in two or three specific areas. For the first time an overall printed program was produced, which summarized information about each presentation, its content, time, and place of presentation. This was distributed at each site well in advance of the beginning of the Media Exchange Series to promote attendance. Copies were also distributed at each presentation itself. Simple, although often expanded, written material still accompanied each specific presentation. Videotape format with but one exception had settled on 3/4" videocassettes and several programs were produced in color. Finally, the group shifted almost universally from speakerphones to the Bell Conference Telephone (model 50A) which allowed a substantial improvement in the audio elements of the conference telephone call. All during this phase, the content of programs was subsummed under a generic title of "Moral, Ethical, Legal Issues", but in addition, a specific sub-topic area was chosen to further direct the focus of the presentations. The actual content of individual productions was still the responsibility of the local agency. However, seminal efforts were begun to coordinate and integrate content elements, a process that continued and reached fruition in Phase V. Finally, the process of identifying a central moderator to coordinate the presentation sequence, to establish protocol and to direct the training of local coordinators was completed. An expanded committee system was also established to direct the entire planning and development process as well. This group utilized the conference telephone call as a major technology to facilitate planning (with the additional benefits of training local moderators). Several incidental meeting of subsets of the committee membership further aided the planning process.

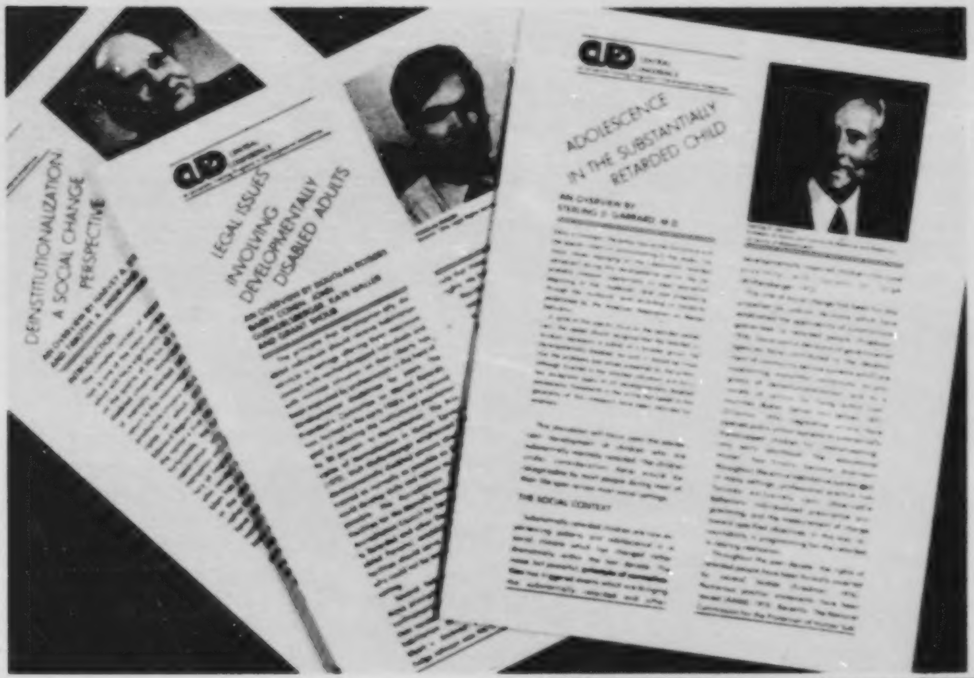
Phase Four

Phase Four (1978) began the refinement of presentation and organizational elements in that the Central Conference, through one of its members (Cincinnati Center for Developmental Disorders) won a regional grant from the Department of Health, Education and Welfare to support its consortial effort in the development of training materials for inter-university instruction in the area of developmental disabilities. This allowed for the establishment of a full-time coordinator (Media Specialist) along with support staff to facilitate the further development of the Media Exchange Series and to develop related approaches to mediated instruction and information exchange. Each agency was still to pay for the development of its own videotape presentation but related costs of planning, printing, duplication and conference telephone calls were to be borne by the grant. This greatly enhanced the planning effort by providing 12 months of manpower and the other necessary resources to support this growing enterprise. Face-to-face planning meetings supplemented by conference telephone calls and visitation to sites by the Media Specialist helped to draw things into an even tighter, more cohesive effort. Content became even more focused and the thrust became to develop a highly structured and comprehensive set of presentations accompanied by appropriate printed materials and professional resources.

Phase Five

Phase Five (1979-1980) began last year with a frontal attack on the area of print materials. By this time, the tape format and telephone equipment had been standardized and protocol for the conference telephone calls had been well-established. It was in the area of print materials to accompany each presentation that work needed to be done.

Up to this point, the written materials that accompanied the videotape programs were non-standardized. That is to say, there was no prescribed format, length nor intent to limit or direct content. Copies of these materials were provided with the videotape and were to be duplicated at each location, usually in the form of mimeographed or photocopied materials.



DEINSTITUTIONALIZATION
A SOCIAL CHANGE
PERSPECTIVE

LEGAL ISSUES
INVOLVING
DEVELOPMENTALLY
DISABLED ADULTS

ADOLESCENCE
IN THE SUBSTANTIALLY
RETARDED CHILD

AN OVERVIEW BY
STERLING D. GARRARD, M.D.

THE SOCIAL CONTEXT

Adult Programming

CENTRAL CONFERENCE

1979 MEDIA EXCHANGE

ADULT PROGRAMS

ETHICAL AND

INTERVENTION:

ADOLESCENCE
AND BEYOND

PRODUCED BY
CINCINNATI CENTER FOR
DEVELOPMENTAL DISORDERS
UNIVERSITY OF CINCINNATI

ABSTRACT

OBJECTIVES

LEGAL ISSUES

ADOLESCENCE
IN THE SUBSTANTIALLY
RETARDED CHILD

Print materials for the 1979
Media Exchange

The top picture shows the three overviews prepared for the 1979 Media Exchange. The photograph on the right shows an array of print materials including: (clockwise from the top) large poster, overviews, supplements for each program, gray binder to hold the collected materials, and the program brochure.

With the availability of a full-time media specialist and support staff, the thrust was to use this person to develop a standardized format for the program supplements with content however, still being controlled by the producer and his or her staff. Through negotiation and discussion, the following plan emerged: a) 4-6 printed pages would accompany each videotape program; b) each print supplement was divided into specified content areas including an abstract, program objectives, program narrative, questions for discussion, references, acknowledgements, etc. The length of each segment as well as their physical location within the overall print supplement was standardized. This made it possible to easily locate a particular kind of information in each supplement. A special binder was provided so that each attendee received not just a series of print materials but a binder in which to keep them. As before, an overall program brochure was also printed and was used to provide advance publicity. The program content in this phase moved toward a tighter and more integrated package. Consultants were used to develop content areas and sub-topics moved from the realm of individual choice to negotiated assignments to individual producers. The goal was to produce a mini-course or workshop climate with integrated topics and related materials. The content often fell into discrete subgroupings, and this allowed the preparation of overviews, commissioned by the Central Conference to be written by avowed and recognized experts in those content areas. The overviews provided important background information to supplement the program offerings. What emerged then was a comprehensive set of print materials to extend and broaden the impact of the established videotape-conference telephone format. Another print addition during Phase Five was of a printed flyer, made available months in advance of the actual Media Exchange presentations for the purpose of providing advance publicity.

This phase saw other major advances as well. For the first time, the evaluation process included an attempt to look at the accomplishment of content goals. Producers developed a set of behaviorally-defined objectives--usually 4 or 5. These were printed in a standardized format and location in each print supplement. Accomplishment of each objective was rated by the audience using a 5-point rating scale.

Finally, conference call set up was turned over to the Darome Connection, a commercial bridging operation. This allowed for more punctual establishment of the conference call segment in that each presentation site called in to the bridge at a pre-assigned time. In addition, it allowed for a measure of quality control as well. Audio levels could be adjusted and the calls could be monitored so that disconnects and other problems could be easily rectified. This was perhaps the biggest advance in terms of the impact it had on the audience--multiple locations and voices all coming through strong and clear. This also served to enhance the comfort level of moderators who felt that a major technical support had been added. Thus, Phase Five has brought with it significant refinements and advances.

The Future

The member agencies of the Central Conference have always viewed the Media Exchange as an evolving process. There are constant efforts to update and improve the system and its delivery of information to students and others. At this point, the participants are pleased with the system that has developed over the years. It seems to provide a viable mix of elements -- videotape, print material, conference telephone and on-site coordination -- that have proved successful in meeting the overall goal -- to provide valuable training information to those attending the Media Exchange.

One addition to our internal communications structure occurred in 1979. During that year, the participating agencies were connected in a computer message system (On-Tyme) which has allowed greater flexibility, particularly in the planning efforts. The system allows any member to enter printed messages which can be sent quickly and efficiently to all others. We have used the system to outline agenda items that will be pursued in subsequent conference calls and to provide updates on progress. A primary element of our success has come from the fact that the key people at each of the agencies have kept lines of communications open through letters, telephone calls and, now, the computer message system. It is important that all of the planners be kept informed and that we are constantly reminded of Media Exchange activities.

In the years to come, we expect greater use of the computer system. One plan calls for the entering of evaluation material immediately following each presentation. That will considerably shorten the time required for compiling the evaluations and returning the results to all participants. If we can recognize quickly that one element is not working properly, or needs refinement, we can take steps to rectify it prior to the next presentation. This will add an element of immediacy and timeliness that could strengthen the exchange.

Plans are now underway for the next phase of the exchange. We are planning ways to expand the usefulness of the materials produced for the series through the use of Computer Assisted Instruction. The plan we are now envisioning would place a videocassette player and a micro-computer at each of the participating agencies. The videotape programs produced for the Media Exchange would be duplicated in half-inch videocassette format. New interface mechanisms are now available that would allow the micro-computer to control the playback of the videotape, stop and ask questions, repeat sections where necessary, allow for some testing of the students and provide evaluation on the usefulness of the material. If this approach proves useful, the next step would be to see that similar units are placed in related agencies to greatly expand the audience for the materials produced. Funding for this kind of activity is now being sought.

We have tasted success in the Media Exchange as it has evolved from a "show-and-tell" to a carefully defined teaching package. This success is demonstrated in the fact that three of the participating universities are now offering continuing education units to those people attending the programs. In addition, certification has been received from the Ohio Psychological Association and the Qualified Mental Retardation Professionals (QMRP) program in Ohio. We hope that, as the content of the Media Exchange continues to be refined, that each year will see the development of core material that can be used for workshops and accredited courses at the participating agencies and elsewhere.

The future for the Media Exchange is bright. What we have now is a process which works very well through the careful mixing of media and human efforts. We all feel the committment to look forward -- to further refine the elements that are now a part of the Media Exchange, and to look to new strategies and technologies to further the impact of the Media Exchange material for those people working in the area of developmental disabilities.

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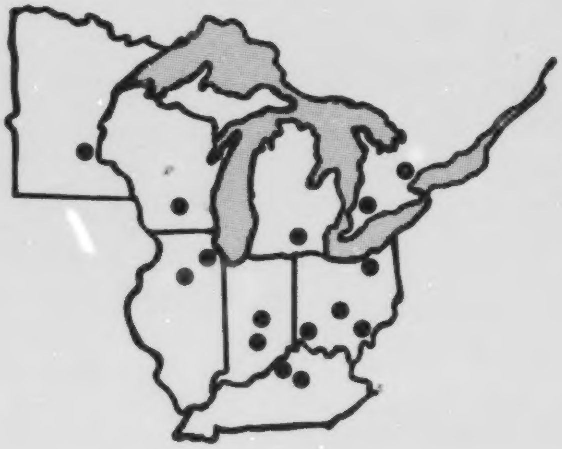
Additional Information

For additional information on the Media Exchange and the Central Conference the reader may consult tne following articles.

Vesprani, G.J.: "Media Mobility: How to Promote an Inter-University Exchange." Biomedical Communications. 5:1, 1977.

Vesprani, George J. and William C. Veatch. "Teleconference and Videotape as Teaching Tools for Multi-University Instruction." Journal of Biocommunication. Volume 2, 1980

CENTRAL CONFERENCE MEMBER AGENCIES



Allied Agencies Center University of Illinois-Peoria
Illinois Institute for Developmental Disabilities University of Illinois-Chicago
Developmental Training Center Indiana University-Bloomington
Riley Child Development Center Indiana University-Indianapolis
Child Evaluation Center University of Louisville
Human Development Program University of Kentucky
Institute for the Study of Mental Retardation and Related Disabilities University of Michigan
Child Development Section, St. Paul-Ramsey Medical Center University of Minnesota
Center for Human Development Ohio University
Cincinnati Center for Developmental Disorders University of Cincinnati
Nisonger Center Ohio State University
Mental Development Center Case Western Reserve University
Children's Psychiatric Research Institute University of Western Ontario
National Institute on Mental Retardation York University
Waisman Center on Mental Retardation and Human Development University of Wisconsin

INTERACT
A MODEL INTERACTIVE TELEVISION NETWORK

Marshall L. Krumpe
Manager
INTERACT TV Consortium
Hanover, New Hampshire

The overall objective of this publication is to help facilitate people's interest and awareness of two-way television. Specifically, however, it is the interest of the author to: a) help in communication system analysis; b) selection of a proper media to meet pre-determined needs; and, c) if two-way television is evaluated as the ultimate medium, to help users implement such a system based on the INTERACT TV Model.

My thanks and acknowledgement to Dr. Dean J. Seibert ("A Decade of Experience Using Two-Way Closed Circuit TV for Medical Care and Education")for his contribution to this report.

Why a Network -- What to Look For...

Why a Network -- whether it be one-way, two-way, cable, slow-scan, microwave or satellite? Availability of funding is unfortunately too often the answer to the above question; and an answer that more often than not leads to an inefficient, underutilized "skeleton in a closet".

The correct answer to the question of "Why a Network?" is - recognized and documented need. The following are a few of the thoughts which have crossed my mind if I were evaluating the rationale for investment into a communication system.

a) Needs assessment prior to choice of technology
b) What technology fits the need
c) Program - Type and Audience
d) Affiliations
e) Budget - How to survive
f) Barriers

Interactive Television is a vehicle for programming which in order to succeed must be flexible and respondent to the changing needs of existing "users" and sensitive to new and innovative uses (and users).

The following outline is an expansion of the points listed above.

A. Needs Assessment Prior to Choice of Technology
   1. Is there a need - identify and define
   2. How relevant - can it sustain capital depreciation and operating costs
   3. Compatibility with existing systems
   4. Relative advantages - one system to another
   5. Is there a functional relationship already existing among prospective users
   6. Physical location - be as mutual and convenient as possible in order to be attractive for alternate users

B. What Technology Fits the Need
   1. Two-way audio and video (cable, duplex microwave, satellite)
   2. Two-way audio, one-way video (cable, ITFS microwave, satellite, slow-scan)
   3. One-way audio and video (broadcast TV)
   4. Two-way audio (teleconferencing)

C. Sample Programming
   1. Teaching - continuing education, continuing medical education, student education
   2. Consultations - all professions
   3. Patient education
   4. General services - business/staff meetings
   5. Digital information
   6. TV Guide as means of disseminating information

D. Affiliations Helpful in Solidifying Health Based Communication Network
   1. Local hospital associations, AMA, State Medical Society. Continuing Medical Education, Blue Cross/ Blue Shield, etc. These organizations may also prove to be

useful as programming and funding sources.

E. Budget - How to Survive
   1. Broad programming base - need to be flexible - do not limit to one speciality
   2. Prior dollar commitment - subscriber, ad hoc
   3. Funding sources - private foundation, federal government
   4. Full utilization of equipment and manpower by expanding on videotape production, utilizing existing equipment and man power and, by taping for distribution programs aired over the Network
   5. Integration of system(s) for maximum dispersion of information - microwave to cable for local redistribution - microwave to tape for national redistribution

INTERACT - A Model Network

INTERACT - The Time

INTERACT, a network which serves rural Vermont and New Hampshire was conceived ten years ago. The late 1960's and early 1970's were a time of turmoil for this nation. Concerns for greater access to better health services were translated by Congress and the Executive Branch into a multitude of programs which emphasized the needs of the rural and urban disadvantaged. Federal sharing of the cost of medical services for the elderly and the poor was initiated through Medicare and Medicaid. Inequities in the distribution of care were addressed in community programs of the Office of Economic Opportunity and through the Partnership in Health Act (C.H.P.) and regional cooperative efforts, focusing on heart disease, cancer and stroke, were stimulated through Regional Medical Programs. Emergency Medical Services became a major thrust. Federal interest in the innovative application of technology was expressed through the establishment of the Lister Hill National Center for Biomedical Communications and the National Center for Biomedical Communications and the National Center for Health Research and Development. Some of these initiatives have proven to be ill fated, yet almost all have left a lasting impact at the grass roots level.

During this period, the nation's new priorities had a substantial effect on our medical schools. As emphasis on health care shifted from biomedical research to the delivery of care, medical schools increased their enrollment, training of new categories of health workers was begun and many schools became deeply involved in service programs.

Although the impact of all of these develments in New Hampshire and Vermont would be difficult to quantitate, at least one study suggests that the effects have been profound. The medical care system of this region a decade ago, when INTERACT was conceived, was characterized by an almost total commitment to laisse-faire health services, but today cooperative efforts for the common good no longer trigger a reactionary response. This is not to say that a sense of fierce independence has been totally lost or that interference in the region's autonomy is no longer an issue, but the rationale for cooperative endeavors is far more readily acknowledged. INTERACT emerged during that era as a means of distributing and sharing in a region where supply is limited.

The problems and successes of INTERACT over the past eight years must be considered in the total context of the period. INTERACT has facilitated change and has in turn been influenced by its milieu.

INTERACT - The Place

INTERACT extends from the northwestern border of New Hampshire to the northwestern border of Vermont, running diagonally across the northern part of the latter. The country north of INTERACT is rural, with populations of towns and cities averaging slightly more than 1000.

Health services, like the communities, tend to be isolated and fragmented. Hospitals in the area are relatively small and fiscally poor. Need for communication is substantial but the ability to develop and support new systems without subsidization is questionable.

The region is characterized by mountainous terrain which restricts travel, particularly in an east-west direction. Paranthetically, these mountains also provide a barrier to the use of microwave television, which requires line of sight transmission although as relay points are established by the State's educational television network, this constraint is gradually diminishing.

While primary care is provided in the Northeast Kingdom of Vermont and the North Country of New Hampshire by local physicians and community hospitals, the need for more sophisticated services is filled by the Medical Center of Vermont at Burlington and the Dartmouth-Hitchcock Medical Center in Hanover. In addition to the joint North Country catchment area, the Medical Center of Vermont serves as the referral point for most of western Vermont and bordering New York towns, while the Dartmouth-Hitchcock Medical Center relates to the Connecticut River Valley, encompassing most of southwestern New Hampshire. Consequently, there have been functional links between all facilities in the network. Nevertheless, because of geographical isolation, the historical necessity for self-reliance, personal characteristics of reserve, often bordering on suspicion, and very few dollars to catalyze change, the pace of developing cooperative regional relationships has been predictably slow.

Early Planning and Policy Formulations

The late 1960's encompassed a dramatic period of growth for the Dartmouth Medical School as it began its reemergence to an M.D. degree granting institution. The relationship of the School to the other components of the Medical Center (Mary Hitchcock Memorial Hospital, Hitchcock Clinic, Whiter River Junction Veterans Hospital), the relationship of the School and Center to the region, and the relationship of the established basic science departments of the institution to the new clinical segments generated a dynamic and not infrequently chaotic atmosphere which stimulated a search for new solutions to problems both old and new.

A principal concern of the medical school was, and is, to find effective ways for a small institution to relate meaningfully to a large rural area. A number of studies were conducted under various auspices in the region in the 1960's which helped to define the needs of those rural areas of New Hampshire and Vermont served by the School. These studies encompassed Sullivan County, New Hampshire as well as the North East Kingdom and North Country of Vermont and New Hampshire. The latter study recommended "massive involvement of the medical schools (Dartmouth and University of Vermont College of Medicine) in the region, "but it provided few new insights on how this involvement could be realistically implemented.

Studies were conducted by several different groups in the 1960's to determine the feasibility of meeting some of the region's needs via closed circuit television. The "New England Land-Grant Network," published by John Bardwell in 1968, considered the feasibility of establishing information links between six land grant universities in New England. Dartmouth Medical School funded an Engineering Study in 1967 which was conducted by Raytheon to determine the cost of extending a network into portions of the North Country, an area then and now considered to be of high priority. A two way closed circuit television system, leased from the telephone company, joined the Dartmouth Medical School to the Claremont General Hospital in 1968.

The capital cost of building a microwave network was of major concern but it was recognized that cost of mountaintop construction, maintenance and repair of equipment could be minimized by sharing existing educational television equipment at mountaintop relay points. It was also recognized that the location of the then existing E.T.V. towers would define the configuration of the network to a significant degree. A compromise was required between reaching those facilities where extreme isolation created maximum need and maximum cost and those facilities which could be reached with a more "reasonable" capital outlay.

Discussions concerning the individual needs and resources which might be shared via closed circuit television, were initiated among representatives of the educational television stations of Maine, New Hampshire and Vermont, health educators from Dartmouth Medical School, the University of Vermont College of Medicine and the University of New Hampshire and with those administrators and staff of community hospitals which lay in the path of the E.T.V. microwave backbone.

At the suggestion of the Director of Continuing Medical Education of the American Medical Association, the interests of these individuals, who were a-priori early INTERACT planners, were brought to the attention of Dr. Ruth Davis, then Director of the Lister Hill National Center for Biomedical Communications. A series of discussions and the development of a specific proposal to the Lister Hill National Center for Biomedical Communications led to the funding of a technical feasibility study conducted by the Atlantic Research Corporation and to the exploration of additional uses of the existing phone company microwave link between Dartmouth and the Claremont General Hospital.

The technical feasibility study included twenty hospitals and educational institutions that were located in areas where there was direct line of sight with or without a modest tower to one of the E.T.V. mountain top relay points. Upon completion of these studies and a further assessment of interest among potential users, a number of critical decisions with far-reaching implications were made both at the federal and local level.

It was necessary for the Lister Hill Center Center to decide on the magnitude of their investment in INTERACT, a decision which would be influenced by competing priorities and their assessment of the program's intrinsic value. Should the entire network be built in one phase or should it be developed in a step-wise fashion?

construction of the entire network, extending from the Maine Medical Center in Portland to Burlington, Vermont had the virtue of involving a great diversity of users, long-term supporters, both in rural and metropolitan areas. The investment would have been high, however, for a demonstration of unproven value. On the other hand, too small a demonstration might not establish the critical mass of usage and experience which would be required to justify the network's future. It has been stated that the telephone was not a particularly helpful device until it linked many individuals and that the automobile was considered an expensive novelty until enough were owned to justify the design and construction of roads which could accommodate them. Too small a demonstration might similarly compromise the acceptance of interactive television. A network of four to six institutions seemed to be appropriate compromise.

Since it was not deemed feasible to build the entire network in one step, it was necessary to select a limited number of institutions from the many that had expressed a desire to be involved. Factors which influenced this selection included:

1. The perceived level of institutional interest.
2. The distinguishing features of each hospital or educational institution which would foster a difersification of use.
3. The nature of the basic funding for the hospitals and schools; public, private, state agency, etc., and how their diverse fiscal base might contribute to the potential for long-term support.

A decision was made to join the Medical Center of Vermont which includes the University of Vermont College of Medicine and School of Allied Health Science, both state supported institutions, Dartmouth Medical School, a privately endowed educational institution and the Claremont and Central Vermont Hospitals which had a close working relationship with the two medical schools.

Plans were also finalized to link three quite different facilities to the network on a part time basis using a mobile unit, including a Vocational Technical College which emphasizes allied health training, the Windsor State Prison, Vermonts only maximum security facility at that time and the Rockingham Memorial Hospital, a small community hospital.

The compromise meant that the network would not reach the more populated and prosperous areas of New Hampshire--Concord, New Hampshire's capitol and political hub and Manchester, the state's modest industrial center.

Extension into the North Country of New Hampshire and the Northeast Kingdom of Vermont, the areas of greatest need were also excluded by the funding constraints because of the mountainous terrain, the lack of E.T.V. relay stations and the unlikelihood that the very small hospitals of the region would ultimately be able to sustain the operating costs of the network.

Dollar limitations forced another decision which had a significant impact on network development. Sufficient money was available to 1) complete construction of the two ends of the network, (Burlington--Central Vermont and Hanover--Claremont) and employ the principal investigators at U.V.M. and Dartmouth or 2) to complete the network from Burlington to Claremont with the expectation that the two principal investigators would derive their support from other sources. It was the decision of the two principal investigators to pursue the latter course.

It was impossible at the time and difficult in retrospect to estimate the impact of that decision on INTERACT's development over the succeeding five years. Dartmouth's principal investigator, the Assistant Dean for Regional Medical Affairs, and U.V.M.'s principal investigator, the Director of Continuing Medical Education, were responsible for developing the relationships of their respective institutions to the community in a variety of ways. This diversification of responsibility proved to be both an asset and a liability. It provided avenues through which institutional policy relative to the region could be influenced was well as working relationships with many individual institutions who were persuaded to consider INTERACT as a mechanism for implementing regional programs. The diversity of responsibility of top management on occasion, however, compromised their ability to provide sufficient leadership to INTERACT especially when other sources of their support became unstable. At such times forward momentum was slowed and sometimes stiffled.

Planning for INTERACT has been characteristically flexible and "opportunistic intervention" as the demonstration evolved from a single link to a complex network. This flexibility was its early strength; without it, successful implementation would have been impossible. While the ultimate goals remained unchanged when opportunities to explore new avenues occurred, short-term plans were often modified in order to capitalize on interests and resources which unexpectedly became available. While the principal of "opportunistic intervention" became an acknowledged and useful modes operendi, often overriding more deliberate planning, the efforts to capitalize on special circumstances on occasion led to an inefficient scattering of resources and fragmentation of effort. There is no sure way to avert conflicts between long-range planning and the implementation of short term objectives in a domonstratation which is experimental in nature and derives strength from flexibility.

For INTERACT, the conflict between rapidly changing short term plans and the steady pursuit of long range goals, including that of self-sufficiency, was greatly complicated by a substantially shorter period of stable funding than had been anticipated. The time frame originally envisioned by the LHNCBC is unknown but a decision was made to terminate support within eighteen months of full network operation regardless of INTERACT's stage of development.

Arguments presented to support requests for a continuation of funding which would have provided stability while new users had an opportunity to explore its potential were not persuasive.

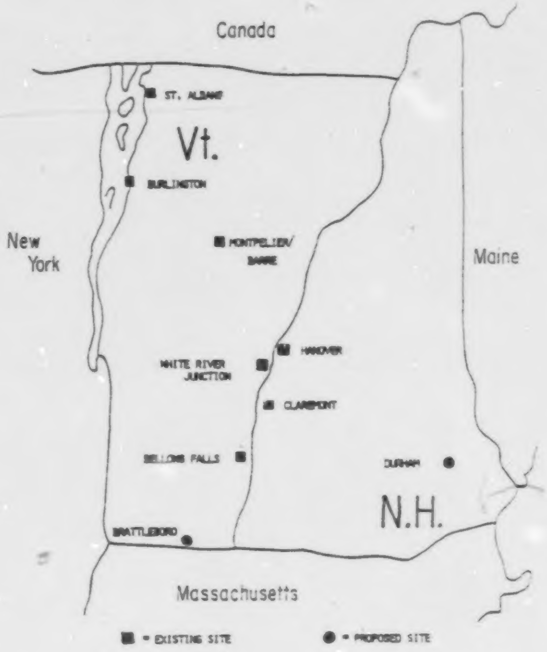
After a relatively brief period of operation, the overriding goal became one of gaining self-sufficiency. Development of new network programs dropped markedly and by 1976 had come to a virtual standstill. Efforts at evaluation, except in the most superficial sense, were abandoned. New areas of activity, particularly videotaping for "in house use," were developed for immediate cash return. Profound uncertainty resulted in the loss of key personnel and the momentum which had been building for several years was perceptibly slowed at the potentially most rewarding phase of the demonstration.

A number of vital steps were taken to respond to the emphasis on organization and management rather than program development. Each of the participating facilities was required to make a substantial fiscal committment to the network. In the case of the community hospitals in particular, this committment far exceeded any previous support that had been allocated to continuing medical education activities. Fortunately, federal economic stabilization controls which had placed a five percent ceiling on annual hospital expenditures in 1971, terminated on April 1st, 1974. If that constraint had not been removed, almost certainly the demonstration would have been required to terminate.

In order to give each of the participating institutions equal representation in formulating operating policies, Station Councils and a Network Advisory Board were established. Currently, a more autonomous organizational structure which reflects the fact that INTERACT has become a consortium is now under consideration.

Despite the necessity for focusing on immediate issues of self sufficiency, planning for the future has not been neglected. Only a small fraction of the network's potential has been developed and efforts to identify resources which will allow new users to explore the utility of the network remains a high priority.

Consideration of future network expansion goes forward. It is anticipated that two new stations will be added in 1980-81 and extension of the network into both the underspread and more populated areas of Vermont and New Hampshire remains a high priority. A second dimension of INTERACT, the distribution of tapes recorded from live programming to hospitals which are not connected to the microwave network has evolved from a 1976 feasability study. This new program, Media Outreach, while not providing the ease of access to medical information that is fostered through live programming, fills a gap which will remain until the cost of closed circuit networks can be borne by even the most isolated facilities.



Administration

One of the distinguishing characteristics of INTERACT is its organizational status. The end result of federal research and demonstration monies and local support is an organizational chimera. It is a mix and match of private and public; university and hospital; the big and not-so-big; the volunteer and the salaried employee; the old and the new; the committed and the indifferent. It is the outcome of planning in an experimental framework in which the component parts are independent and whose ultimate common interest in INTERACT could only be surmised. As the network became financially dependent on the user institutions, it became imperative to formalize relationships between them which would provide broad representation and accountability. Figure 1 indicates the current organization structure. It should be noted that the Consortium Board of Directors is the true governing and policy-making body. Administrative links parellel to that level simply reflect the fact that as holder of the F.C.C. licenses, the Trustees of Dartmouth College are held legally accountable for the system.

It should be noted at this time that INTERACT management, and Dartmouth College all agree that the future of INTERACT's development somewhat hinges on its relationship with Dartmouth College. There are many reasons for maintaining an affiliation with Dartmouth College, however, it is believed by the majority that INTERACT could be more flexible in its growth if it were to go beyond the establishment as a regional consortium, to a free standing legal entity.

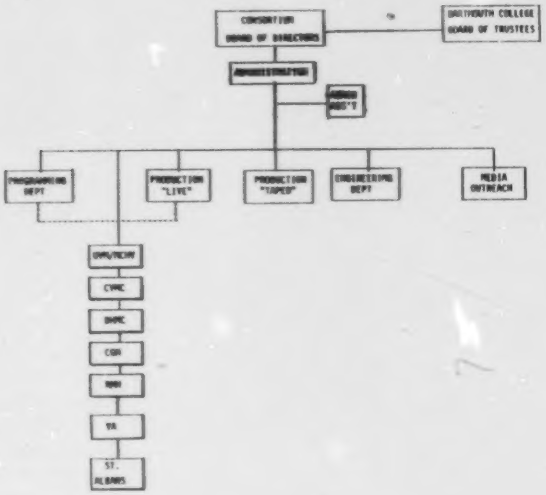


Figure 1

Consortium Board of Directors

The Consortium Board of Directors was created to set policy and advise Network management and Local Station Coordinating Councils in the total operation of the network. Board membership consists of primary delegates from each local council.

The Board is viewed as an organizational necessity for influencing decisions by network management and local stations. Its primary task is to provide a total network perspective which encourages individual stations to work together for the stature and growth of the Network.

Local Station Coordinating Councils

Local Station Coordinating Councils, as the name implies, support the local station manager in coordinating programming between the Network and the local station. As such, the councils review programming and the impact of such programming. The membership of each council represents the administrative, financial, medical, nursing and continuing education interests of the participating station.

Local Stations

Local stations are the facilities which receive and/or originate programming throughout the Network. These stations are united by a common carrier: INTERACT. The organizational tie is made via the Local Station Coordinating Councils and the Board of Directors. The financial bond is found in Memorandums of Understanding (open contracts) between INTERACT and the institutions representing the Local Station.

Network Staff

The final line in the organizational chart is Network staff. It is appropriate that everything finally comes down to this category where it all happens. Network staff provides the foundation upon which the organization is built. Currently the staff consists of twelve (12) full-time professionals, four (4) part-time high school work-study students and four (4) part-time production and management resources available as needed to meet demands of programming.

Network staff are currently employees of Dartmouth College, and each position is graded and salaried according to policies established by Dartmouth Personnel. It becomes necessary to detail the general descriptions provided by Personnel in order to reflect the team concept of production-engineering-management services. All staff provide services according to these areas with an obvious emphasis on individual professional training and background.

The question often arises - Should INTERACT employ station personnel at subscribing hospials; or should the job or station manager be incorporated into the daily tasks of an existing hospital employee(s)?

INTERACT has had firsthand experience in both cases, by virtue of the fact that our Rockingham Memorial Hospital station is manned by hospital staff. And, even though our Claremont General Hospital station manager has responsibility for Rockingham Hospital (and spends two days a week at that location), the effect is not the same as having a full time INTERACT employee. If, however, a well-identified need/relationship exists between institution(s), thus eliminating the program development responsibility, a hospital employee may be able to function adequately.

Money Management

One of the most difficult financial tasks has been the securing of operational funding. The first and possibly most major obstacle has been overcoming the initiation "try it -- you'll like it" concept; whereby, the users of the Network had free access. Some preparation had been made with user institutions to secure their financial support while still on soft money -- but not enough.

We have over a period of years transitionalized to the point where our institutional subscribers actively budget our costs into their fiscal year plan. In addition to subscriber income, which varies from 7,000 - 20,000 per annum per institution; we have encouraged use of our facilities by non-health, non-institutional users. In addition to revenue generated, via the use of the microwave network; we also secure income for video productions and engineering services.

The following represents INTERACT's rate structure: (Noting that our airtime programming is a Network priority because it is the means for providing interaction among all stations, and represents the primary source of income.)

1. INTERACT subscription fees, set by the Board of Directors, represents a base fee plus anticipated use per station.

2. All ad hoc airtime programming will be charged for on a $50.00 per hour, per station basis.

3. There will be NO reductions or changes in rates for:
   a) originator
   b) long term vs. short term user
   c) inside vs. outside user

4. The above hourly rate includes "normal" set-up and take-down. "Normal" equalling approximately 1/2 hour per program of one person's time.

5. Additional charges per any airtime programming will be reflected on:
   a) Job Order Ticket and be charged as follows:
      1. Additional "set-up/take-down" time @ $15.00/person/hour
      2. Additional production equipment @ rate schedule
      3. Additional production personnel @ $15.00/hour
      4. 2 and 3 above rates are computed from set-up through take down

6. An evaluation of perspective inside users' source/quality of funding will be made in order to determine if that user could support our rate with "outside" money.

7. An outside user, if evaluated favorably by all relevant station managers and the Network Manager, may be able to charge a program(s) against prepaid "inside" money. This case would only arise if an outside user, without funding support, had a program which would realistically benefit any or all prepaying institutions.

Non-Airtime Rate Structure

1. Non-airtime programming production rates are established by computing:
   a) $15.00 per hour, per person for all INTERACT personnel, plus
   b) pertinent rate(s) from the production/equipment rate card
   c) Tape stock not included
   d) Travel time, mileage and miscellaneous expenses not included.

Rental

Due to the fact that 90% of INTERACT's equipment is government purchased, it cannot be rented. However, a maintenance charge of 2% of replacement value is charged for the use of loaned equipment. No equipment is loaned without an INTERACT operator unless approved by Network Manager.

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Personnel Cost Rates are determined as follows:

$5.00 - reflects to Administration
$5.00 - reflects to Engineering
$5.00 - reflects to Production

$15.00 Total Charge

This procedure is followed in order to provide revenue to sections of INTERACT which, under normal business environment, would be generated by Equipment Rental at 5-10% of Market Value.

The following reflects INTERACT's FY 79 fiscal summary. For further clarification, the expense portion of this summary does not reflect equipment depreciation (per the rules of government-owned equipment).

INTERACT FISCAL SUMMARY - FY79

Revenues	Total
Subscriptions	$ 101,000
Ad Hoc Airtime	13,654
Tape Production	51,180
Other	65,467
TOTAL	$ 231,301
Expenses	
Personnel	$ 168,250
General Op	30,420
Other	20,215
TOTAL	$ 218,885
Surplus %	12,416

The last avenue for securing revenue is through grants and contracts. Although I am not a supporter of this type of revenue support for operating expenses, I fail to see any other alternative than "soft money" support for capital expansion and equipment replacement.

Another point worth noting is the recent willingness in our region of third party insurers to openly condone reimbursement to health institutions for their involvement with INTERACT.

Expenses are divided into "inside" - institutional subscribers and "outside" - all others. Both are recorded on a monthly financial report to each station manager, with the latter also being processed through a formal billing prodcedure.

In order to insure all tasks are properly assigned a rate and a customer, each person performing "outside" work completes a "work tag" which is processed through a system of accounts and billed accordingly. An accounts receivable schedule has been established to insure payment.

How Does the System Work - Programmatically

The value of INTERACT Network lies in programming and its relative interaction and impact on the user. INTERACT's current programming falls into the following categories:

1. Consultations
   Examples: a) dermatology
   b) client - lawyer
2. Specialty Conferences
   Examples: a) ENT (UVM - DHMC)
   b) Human Services (SRS)
   c) Vermont Public Service Board
3. Education
   Examples: a) Continuing Medical Education for Health professionals (to include AMA, Category I Credit) in conjunction with the Office of Continuing Medical Education
   b) Continuing General Education (inc. hospital administration and general public)
   c) Sharing of faculty resources among network educational institutions (Anthropology)
4. Direct Service (Staff Meetings)
5. Patient Education

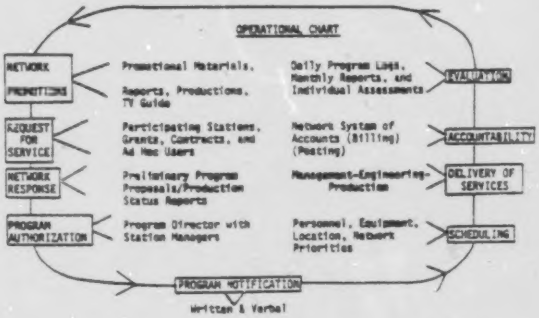
There are some who theorize that a buy/sell philosophy can apply to programming in relationship to the size and type of participating institution. The assumption that all medical centers (in our case - Medical Center Hospital of Vermont and Dartmouth-Hitchcock Medical Center) sell programming and that all small rural institutions buy programming is false within the INTERACT system. One must take into consideration the personality of any given exchange, i.e. is it professionally threatening to ask for help, or I don't give a damn what those country 'doc's' know. We have evidenced many situations where the large resource centers are very willing to disseminate information. Likewise there are examples to reflect the willingness of a small country doctor to ask for educational or professional assistance from the medical center(s). There is also evidence of a strong relationship among the smaller hospitals (RMH, CGH, and CVH), exclusive of the medical centers and vice versa.

I don't believe such buy/sell generalization should be made. Each program and each institution is often independent of all other considerations - the aesthetic part of program development.

In order to avoid copyright problems with program presenters, we send to the sponsoring department or individual participants a release form, stipulating that we are allowed to distribute said programming in an educational, professional sitting.

Responsible Personnel The Network adopts a 'team' approach in providing the service requested by any user. Expertise in production, engineering and management is provided by staff according to the requirements of the production. Position descriptions for each staff member is defined according to responsibilities with production, engineering and management. Obviously, those responsibilities vary in degree by each position and the qualifications of individual staff. Emphasis is placed upon the group effort utilizing the most and best each person has to offer which can result in the best possible product/program. This is better understood with a summary of the process of staff response to user request.

Process The following chart is a summary of such a process which is applicable to all programming.


OPERATIONAL CHART
NETWORK PROMOTIONS
Promotional Materials,
Reports, Productions, TV Guide
REQUEST FOR SERVICE
Participating Stations, Grants, Contracts, and Ad Hoc Users
NETWORK RESPONSE
Preliminary Program Proposals/Production Status Reports
PROGRAM AUTHORIZATION
Program Director with Station Managers
Daily Program Logs, Monthly Reports, and Individual Assessments
EVALUATION
Network System of Accounts (Billing) (Posting)
ACCOUNTABILITY
Management-Engineering-Production
DELIVERY OF SERVICES
Personnel, Equipment, Location, Network Priorities
SCHEDULING
PROGRAM NOTIFICATION
Written & Verbal

It is obvious from the above chart that an essential component of the Network's program activities is labeled coordination. However, the efforts subsumed under this label are much greater and more diverse than one might ordinarily assume. Those individuals bearing the title "Station Manager" at each institution in the system's link fulfill a three-fold role: (a) germination and nurturing of viable working relationships between community, institutional and medical center personnel who are dealing with similar problems; (b) perform the function of a television producer, cameraman, and technician; and (c) coordination itself, which is composed of needs assessment, resource identification, and bringing together of the two at a specific time and place for a mutually agreed upon purpose. In order to successfully accomplish the above, the Station Manager must effect a successful liaison between all other Station Managers and Network Administration.

Culmination of the above occurs on a weekly basis, at which time all station managers and the network manager meet to discuss programmatic concerns of the Network. This meeting provides timely response to program needs, evaluation of new ideas; and, in general, makes each INTERACT 'link' aware of the Network's total program requirements. In addition, yearly program planning sessions are held each June to organize programming which will be aired on a regular (weekly/monthly) basis throughout the following (program) year.

Formal organization and distribution of the programming efforts, noted above, culminate monthly in the form of a TV Guide. This Guide is distributed to 1,000 individuals and institutions in our area of operation. Its purpose is to attract new users, provide awareness of existing programs and to relate items of interest.

INTERACT's stations during the course of ten years have been the originating points for hundreds of programs and thousands of interactions. Interactive programs generally involve small groups of individuals at each of two s stations. Additional stations may be included but they usually relate passively. Although rapid switching between locales is possible, it tends to add an element of confusion to the session and detracts rather than contributes to the degree of interaction unless a pre-arranged switching "sop" is formulated with the program sponsor.

Over the past three years the INTERACT Network has averaged 2,200 hours of institution programming to over 21,000 participants. For FY 80 we anticipate 3,000 hours of Network programming to 25,000 individuals.

Programming - Finding the Need

INTERACT was created with the idea of facilitating medically related information to rural New England. Prior to INTERACT's inception, there was not an "in depth" programmatic needs assessment or utilization study performed. Consequently, several years later (and without Federal funding as a subsidy) INTERACT is having to step back and re-evaluate its usefulness in terms of program needs.

Since the Federal "subsidy" has terminated and "fee for service" begun, programming quantity has decreased and content changed. A cursory evaluation of current program needs reflects that the following are important for the future success of INTERACT TV.

a) Further diversification of programming.
b) More emphasis should be placed on Continuing Medical Education (with Category I Credit) and Continuing

General Education.

c) Initiation of programs utilizing state and local governments and private business
d) Interface with cable TV network
e) Interface with New Hampshire and Vermont ETV Networks
f) The sharing of faculty with network educational subscribers. (i.e. Dartmouth, UVM, and UNH).

Production

Production as related to 'live' telecasting is a multifaceted responsibility. Besides the standard activities of pre-production coordination, airtime implementation and post-production (i.e. administrative) follow-up, the following are additional characteristics to be considered in 'live' two-way television.

a) Studio set-up - in order to promote audience interaction, cameras and monitors must be arranged to accommodate such and not deter the local environment. The environment is influenced by the number of participants, room size, and the type of presentation.

b) Class Size vs. Interaction:

Situation	% of Audience Interaction
1. one-to-one	100
2. sm. group to sm. group	80
3. one-to-group	75(depending on instructor)
4. sm. group to larger group	50
5. large group to large group	20

The Program Director, if consulted, will advocate to a perspective user the situation above which best reflects his/her needs and still promotes interaction.

d) Lighting - In most live production cases, low light (silicone-diode), black & white cameras are utilized. Most users advocate an unobtrusive profile by production personnel. Using the above-referenced cameras, INTERACT production is able to televise in normal room light with little more than a camera, microphones and cameraperson.

From the inception of INTERACT, production or a combination of production and engineering have played an integral role in the implementation of 'live telecasts'. It is only within the last two (2) years that a greater emphasis has been placed on the role of (non-airtime) production.

This later emphasis was created out of the need for more full utilization of INTERACT personnel and existing equipment in order to secure additional revenue. These non-airtime services include:

a) equipment rental (with and without operator)
b) simple videotaping and/or playback
c) complex scripted videotape productions
d) b & c above can be accomplished "in-house and remote"

These services are available, per a production rate schedule, to subscribing and ad hoc users. It is interesting to note that in the first full year of offering this service, it accounted for 27% of INTERACT's operating budget.

Engineering

How does the system work - technically

The Network is a dedicated, closed-circuit, duplex microwave system. The Network consists of a trunk or backbone system, operating in the 6 GHz business band, extending from Mt. Mansfield, Vermont to Mt. Ascutney, Vermont and seven spur links on the 12 GZz band, each connecting a point in the trunk system to a user location. The trunk system shares facilities with Vermont Educational Television, and all spurs are single hop.

Switching between stations is accomplished remotely by use of a touch tone panel located in a Master Control Center at Hanover, New Hampshire. Each participating station can access the network in order to establish audio and video contact with any other staion. Any station may transmit to all other stations simultaneously in a network mode.

Channels provided are:

a. NTSC video
b. Program aural
c. Voice grade intercom
d. Remote camera control subcarriers
e. Physiological telemetry

Audio and video are switched independently of other channels. The system complies with EIA RS-250-A, "Electrical Performance Standards for Television Relay Facilities," other appropriate standards and regulations relating to antenna construction and marking, and F.C.C. rules and regulations.

INTERACT has evolved over the past five (5) years from early planning and the engineers drafting table, to a smoothly operating user oriented system.

It became painfully obvious, during initial operation, that the remote switching, controlled by the TT signals was not reliable. Any non-linearity in the receivers or an operator whose voice was of the required pitch would cause the switching matrixes to be randomly changed. This was always frustrating and sometimes humorous.

On one such occasion, two conferences were being conducted simultaneously using opposite ends of the network. Someone sneezed while wearing headsets, and the effect was chaos. All four groups instantaneously found themselves looking at total strangers. The solution to the problem proved to be a 20KHZ FM subcarrier which was added to the 6.17 channel. The 20KHZ subcarrier was modulated with the touch tone signals and demodulated only at the switching locations. The modulator was designed using an NE 566 IC, the demand is a NE 560 phase locked loop.

Another problem which was successfully solved concerned conferences which involve more than two stations. The system is designed so that while two stations have complete bi-directional video and audio, additional stations have received video and audio capability only.

In order to promote interaction however it was considered desirable to be able to switch rapidly to a passive station so that they would have full bi-directional transmission and would become one of the active parties. It was found however that during the process of switching parts of sentences (often questions) were lost, destroying the communication. In order to obviate this, a new 7.5 KHZ "passive" audio channel was added to all stations.

At each station the main audio program channel (6.8 MHZ) signals, both transmitted and received, are combined and retransmitted on the passive 7.5 MHZ. When a "passive" station switches the input of their audio amplifier from 6.8 MHZ (active) to 7.5 MHZ (passive) they are able to receive audio from both of the "active" participants and thus follow the conversation with ease.

If the "passive" station wishes to interrupt the "active" participants in order to comment, the individual operating the camera at the passive station notifies the central control room through the "head set" intercom.

Systems Design and Equipment Reliability

INTERACT's microwave radio system was designed to match the existing Vermont ETV microwave TV network. Vermont ETV sites provide INTERACT with developed mountaintop facilities in a basic North-South relationship. This routing provides access to the participating INTERACT stations with very minimal costs for site development.

Both the radio equipment and the origination equipment have proven to be quite reliable. The duplex radio equipment in use was manufactured by Microwave Associates of Burlington, Massachusetts and includes:

	(Quantity)
a) Model 7BX	(8)
b) Model 12BX	(8)
c) Model 12G	(2)

After some initial problems in the BX series transmitters, the system has stabilized to approximately 64 hours total down time per year. This figure includes access time to reach unmanned sites to make repairs. In the winter, some mountaintop relays can be reached only by skimobile and snowshoe and in the summer by hiking.

Problems Encountered in Maintenance

The greatest source of maintenance problems encountered at INTERACT have been caused by the "ravages of nature." Damage to antenna structures caused by icing conditions, high winds, electrical storms, falling ice, loss of commercial power for extended periods of time, (i.e. greater than twelve (12) hours) have all been encountered. We seem to be defenseless against this type of disaster.

The origination equipment installed consists of Telemation 2100 series cameras. These have proven to be very reliable. INTERACT engineers modified these cameras to accept Silicon Diode tubes. The RCA 4532 series perform very well under the low-light conditions typically encountered in conference rooms and auditoriums.

As the Network became operational the need for additional equipment to meet user requirements became apparent. In an effort to maximize the available dollars to meet these immediate needs some used origination equipment was purchased. The life expectancy of much of the equipment when purchased new is estimated to be between ten to fifteen years. The useful life of second hand equipment naturally depends on age and original quality.

The problem of allocating dollars for the eventual replacement of this government owned equipment simultaneously with the rapid phasing of the demonstration from federal support to self sufficiency is critical and as yet unresolved.

Because the equipment is government owned or purchased one cannot establish a rental fee which includes capital costs or amortization to other government contract/grant recipients of which INTERACT has many. In addition because the equipment is not owned by the 'custodian' one is not allowed to depreciate or establish a contingency fund for replacement.

Given these circumstances, an element of "self destruction" is built into a demonstration that has a very large technical component.

Currently INTERACT, the ward of approximately $500,000 worth of equipment when originally purchased is unable to generate income from it, cannot depreciate it even if revenue was available to effect such an expense and according to recently enacted F.C.C. rules must replace seventy five percent of it by 1985.

Engineering Manpower Requirements

The number of engineering staff has varied from a high of three to a low of one. An average of two seems to be adequate for typical operations. The logistics encountered in such a system make it impossible to consistently maintain the reliability of the system with just one man. The north and south terminus of the Network are over three hours apart by automobile.

Summary - INTERACT Overview

INTERACT (the Vermont-New Hamshire Medical Interactive Network) is a two-way closed-circuit television system which links together hospitals and educational institutions in northern New Hampshire and Vermont. The facilities currently joined include the Dartmouth-Hitchcock Medical Center (Hospital and Medical School) in Hanover, New Hampshire; the Claremont, New Hampshire, General Hospital, a community hospital of eighty-four beds; the Rockingham Memorial Hospital in Bellows Falls, Vermont, a community hospital of fifty-three beds; the Central Vermont Medical Center in Berlin, Vermont, a community hospital of three hundred and twelve beds and the Medical Center of Vermont (Hospital, Medical School and School of Allied Health Sciences) in Burlington, Vermont; the Vermont Diagnostic and Corrections Facility-St. Albans, Vermont; and the Veterans Administration Center, White River Junction, Vermont. Until its closure in June 1975, the Windsor, Vermont, State Prison, the State's only maximum security facility was also joined to the Network.

The first portion of the Network was funded by the NIMH and in 1968 linked Dartmouth Medical School in Hanover, New Hampshire, to the Claremont, New Hampshire, General Hospital, thirty miles away. The initial demonstration tested the feasibility of providing psychiatric consultations via television.

In 1970, the Lister Hill National Center for Biomedical Communications supported exploration of a variety of health education and service programs between the two stations and simultaneously undertook an engineering study to determine the feasibility of constructing a network which would reach across northern New England. This study included twenty hospitals and schools extending from Portland, Maine to Burlington, Vermont.

In 1971, construction began on a four station duplex network, the backbone of which is carried via three mountain relay points. This system became operational in 1972. In 1973, three additional facilities served on a scheduled basis by a mobile van were joined to the Network and operation of the seven station system was initiated in November of 1973. Capital costs of the Network totaled $783,502.

Three principal factors in addition to a superficial needs assessment were considered in selecting potential facilities to be served which included: the geographic location of the facility, most particularly whether or not line of sight for microwave transmission was available to a mountain top relay point; the unique character of each facility which provided opportunities to explore many different uses; the likelihood that the institutions involved would, in the long run, be able to afford the operation and maintenance costs of the Network. As INTERACT has evolved from a field trial to a fee-for-service operational Network, organizational ties between member stations have been developed in order to assure equal representation among the paying users.

Current FY 80 operating costs are approximately $250,000. Income is derived from member institutions and ad hoc users. A serious problem concerns a lack of funds for equipment replacement. Federal regulations prohibit amortization of federally purchased capital equipment or a rental fee. Thus it was not possible to establish a contingency fund during the experimental years.

Staff responsibilities have been clearly delineated between management, engineering and production. Each of the initial four stations have had a full-time coordinator who has responsibility for defining local community health needs which might be served via INTERACT, identifying resources at other INTERACT stations to meet these needs and catalyzing the necessary programming. We believe that this is one of the most critical aspects of interfacing the technology with the disparate needs of the community.

Internal evaluation has been focused principally on an analysis of user attitudes and acceptance coupled with feedback to management, engineering and production when barriers have been encountered. This trouble shooting and problem solving evaluation has been found extraordinarily useful in gaining acceptance of the Network.

Short-term funding following initial operation of the full Network required a drastic curtailment of new porgram development and evaluation and necessitated an almost exclusive focus on the issue of self-sufficiency. While valuable momentum and opportunities for exploration were thus compromised, substantial strength and unity of purpose evolved from the necessity that users bear the total burden of cost. A non air time dimension of INTERACT has emerged - Media Outreach, which is a valuable byproduct of live programming. Media Outreach videotapes air time INTERACT programs, edits them and distributes them to many hospitals in Vermont and New Hampshire that are not currently linked to the microwave Network.

The future of INTERACT appears promising. Soon another station will be developed in Brattleboro, Vermont, which will incorporate the local hospital, a psychiatric retreat, a child development center and the State Office of Human Services. Also, active planning continues for extension of the Network into southeastern New Hampshire and into the more rural North Country. Linkages with other terrestrial networks via satellite is becoming a more defined goal for the 1980's. And, in the future we may claim the first success at interconnecting two existing networks - INTERACT and the Central Maine Interactive Television System.

Much has been learned, much remains to be discovered. Interactive television is a communication media which is unique. It has its own strengths and constraints. It is not yet fully integrated into our health care and education system. Continued exploration of its full potential, both as a substitute and supplemental way of sharing resources and extending services, provides exciting opportunities for the future. And, as the cost of energy increases, moving information instead of people via technology will be an objective of many organizations and institutions.

THE TELECOMMUNICATIONS INFORMATION NETWORK: A CASE STUDY IN PROVIDING ON-DEMAND INFORMATION TO REMOTE HEALTH CARE SITES

John R. Kues
Project Director
Telecommunications Information Network
University of Cincinnati
Medical Center Libraries

Two major obstacles to maintaining a high standard of health care in the United States are the maldistribution of health-care manpower/resources and the inability of health-care providers to keep current with a rapidly changing body of medical knowledge. Essential information resources, including printed information and medical specialists, are concentrated in major medical centers and inaccessible to health-care providers in rural areas. This "professional isolation" is most often cited as the reason for health-care providers leaving rural practices.[1] One solution to this problem is to supply isolated health-care providers with needed access to information resources.

Telecommunications has been playing an important role in the delivery of health care for over 20 years. Medical teleconsultation and telediagnosis projects have increased the needed professional support to isolated physicians and have provided a support base for non-physician health workers.[2,3,4] Information resources go beyond contact with other professionals; it must include access to information like those found in a well-equipped health sciences library. Because it is not economically feasible to provide major information resources and information searching services at every isolated hospital and clinic, a more realistic approach is to make the existing resources of a larger facility available to the practitioners. The University of Cincinnati Medical Center has designed an experimental project linking four remote hospitals with the resources at the medical center. The Telecommunications Information Network (TIN) uses unidirectional slow-scan television with interactive audio to provide on-demand information in response to specific questions from health-care providers at the site hospitals.

The Setting

The Four Site Hospitals

The four hospitals involved in this project are representative of the majority of hospitals in the United States. They were selected because (1) they typify (in terms of size, staffing, and other factors) the variety of hospitals found in the country, (2) they have identified the need for the types of service offered by this network, and (3) they are supportive of our applied approach for meeting their needs.

Brown County General Hospital in Georgetown, Ohio, approximately 50 miles from Cincinnati, is a 152-bed hospital serving a Southern Ohio Appalachian county. Brown County General Hospital is part of the Health Education Alliance through the University of Cincinnati (HEALTH-U.C.) program which is designed to train medical practitioners in a rural setting with the hope that they will eventually decide to practice there. Information resources at Brown County General Hospital are limited but are developing.

Clermont County Hospital is a 63-bed general hospital located in Batavia, Ohio, and serves the Appalachian County immediately east of Cincinnati. Situated within a community in transition from rural to suburban area, Clermont County Hospital is expanding as Cincinnati's population grows. Information resources at Clermont County Hospital are minimal with no organized library.

Mercy Hospital is the larger of two hospitals serving Hamilton, Ohio, a small city (65,000 population) located approximately 25

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Address communications to John R. Kues, Health Sciences Library, University of Cincinnati Medical Center, 231 Bethesda Avenue, Cincinnati, Ohio 45267.

miles from the University of Cincinnati Medical Center. A 340-bed general hospital, Mercy Hospital services a wide range of patients from its urban, suburban, and rural community. The information resources of Mercy Hospital are well-equippped; a professional librarian provides library services and maintains a good hospital collection of materials.

Bethesda Hospital North is a 240-bed suburban hospital located in northeast Cincinnati. Affiliated with the 480-bed Bethesda Hospital in downtown Cincinnati, Bethesda Hospital North has a very active emergency room and high (98%) occupancy rate. A medical library has recently been provided onsite and a professional librarian offers informational services.

The University of Cincinnati Medical Center

Television cameras and staff for the project are located in the Telecommunications Information Network Office in the Health Sciences Library and in the Drug and Poison Information Center at the University of Cincinnati Medical Center. The combined resources of these two locations (i.e. literature, data, and information specialists) form the foundation for the information services provided by the network.

The Medical Center Libraries forms one of the five units of the University of Cincinnati Medical Center and serves as the information resource center for the other four units: the College of Pharmacy, the College of Nursing and Health, the College of Medicine, and the University Hospital. In addition to the Health Sciences Library, the Medical Center Libraries includes the Nursing and Health Library, the History of Medicine Library, and the Media Resources Center.

The Drug and Poison Information Center has six years of experience in providing on-demand drug and poison information to medical professionals in a rural setting. The Drug and Poison Information Center is a 24-hour service for the medical and lay communities of the Greater Cincinnati area and responds to over 36,000 requests per year. The overall objective of the Drug and Poison Information Center is to promote rational practices in drug usage at all levels of society.

The Telecommunications Information Network

Careful consideration was given to the selection of the appropriate technology for this project. Recent studies have compared several technologies for telemedicine systems and have found no significant differences in their efficiency.[5,6] Conrath et al. conclude that," . . . there is little to distinguish the effectiveness of the four telecommunication modes (color television, black and white television, still frame black and white television, and hands-free telephone) when used for remote diagnostic consultations. Therefore, the cheapest mode is the most cost-effective."[6] The goal of this network is to provide quick access to the primary resources of the Health Sciences Library and the Drug and Poison Information Center and therefore, a visual component is essential. The black and white still-frame television (slow-scan) was chosen as most adaptable to the needs of this network and least expensive.

Each hospital is equipped with a video expander and two video monitors. Two of the hospitals are also equipped with hard-copy printers. The primary (expander, monitor, and printer) and auxilary (monitor) sites were chosen on the basis of their accessability by all health-care providers and closeness to patient care areas that are likely to facilitate questions. Table 1 lists TIN sites at the four hospitals.

TABLE 1
Locations of TIN Equipment at Site Hospitals

Hospital	Primary Site	Auxilary Site
Bethesda North	Health Sciences Library	Emergency Room
Brown County	Education Resource Center	Emergency Room
Clermont County	Pharmacy	Emergency Room
Mercy North	Health Sciences Library	Pharmacy

The TIN Office and the Drug and Poison Information Center are both equipped with a black and white video camera, video monitor, and a video compressor. Figure 1 illustrates the entire network model. The network is linked by standard voice-grade telephone lines.

The Telecommunications Information Network is activated when a health-care provider at one of the sites has a question. He telephones the Drug and Poison Information Center for drug-related questions and the Telecommunications Information Network Office for other health-care questions. The information specialists at these locations then research the question using all available resources of the Health Sciences Library and the Drug and Poison Information Center as well as the over 900 member faculty of the University of Cincinnati Medical Center.

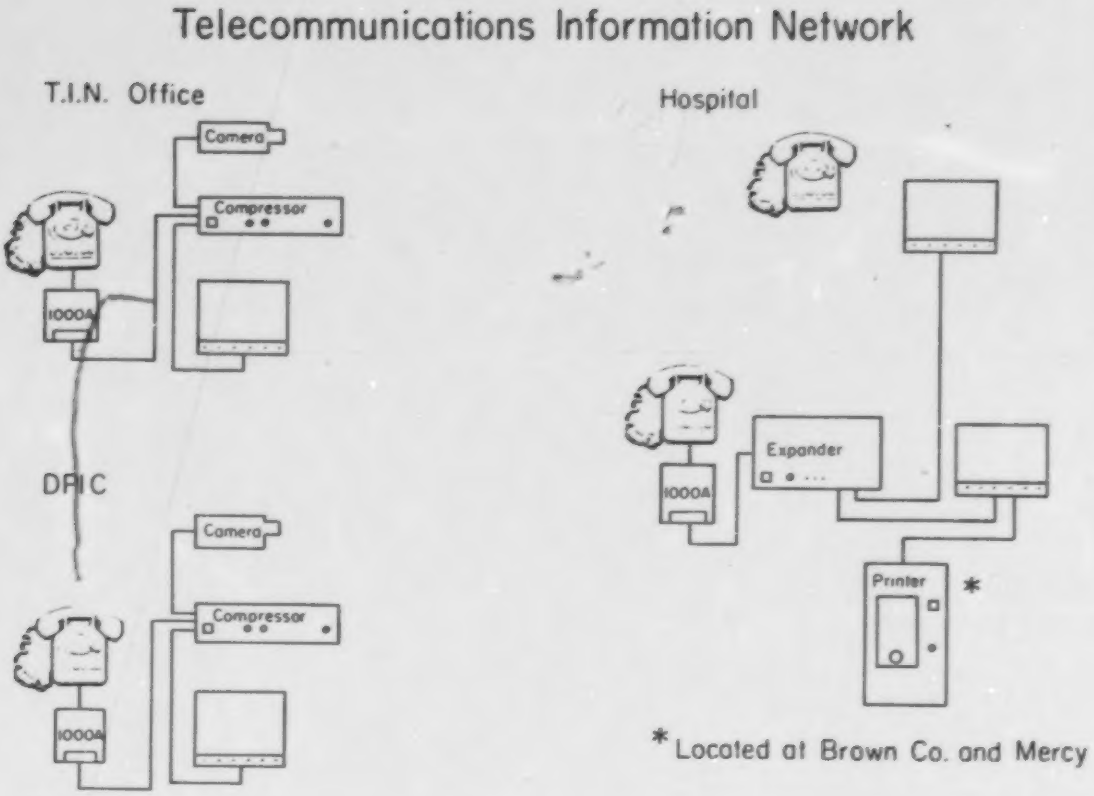
Telecommunications Information Network

FIGURE 1

If the questions can be answered orally then the response is given over the telephone. If a visual image can more effectively answer the question, then slow-scan television is used.

At the start of this project, contact individuals at each hospital were established. The contacts (facilitators) were trained by the network staff in the use of the slow-scan equipment and became the prinicpal contact for individuals at the site hospitals wanting information through the Telecommunications Information Network. Facilitators were chosen on the basis of their affiliation with the primary receiving site, i.e. librarians at Mercy Hospital North and Bethesda North, the pharmacist at Clermont County Hospital and the Education Coordinator at Brown County General Hospital.

The Network in Operation

The Telecommunications Information Network became operational in September, 1979. From October 1 to February 29, 156 requests were researched through the network. Table 2 reflects TIN use by each hospital. Physicians represent the largest user group, comprising over one-third of all requests. Table 3 shows the amount of use by other health-care providers. Among the users comprising the "other" category are: infection control, patients, and social service personnel. The variety of user types suggests that virtually all health-care providers at the four sites have health-care relatied questions that are unaswerable with the resources available to them at their hospitals.

TABLE 2
Use of TIN by Site Hospitals

Hospital	Health Sciences Library	Drug and Poison Information Center	Total
Bethesda North	32	12	44
Brown County	13	15	28
Clermont County	11	12	23
Mercy North	28	35	61
Total	82	74	156

TABLE 3
Types of TIN Users

	(PCT)%*
Physician	35
Other	18
Nurse	10
Pharmacist	8
Administrator	7
Nursing Supervisor	6
Librarian	5
In-Service Director	4
Respiratory Therapist	4
Physical Therapist	3
Total	100

* Based on a sample of 100 requests.

The way in which the requested information will be used provides insights into the information needs of the health-care professionals at the hospitals. Table 4 lists the primary users of requested information and illustrates the primacy of information related to patient treatment approaches. It also points to an emphasis on information for personal knowledge.

TABLE 4
Information Requested Through TIN

	n	%
Research	3	3.5
Teaching	10	11.6
Other	10	11.6
Administration	14	16.3
Personal Knowledge	21	24.4
Patient Treatment	28	32.6
Total	86	100.0

A variety of resources were used by the Telecommunications Information Network staff in responding to requests. Table 5 shows that while the majority of the resources were books and journals, content specialists made up a significant part of the resource pool. The human resources include members of the Medical Center departments, hospital staff, drug company representatives, and state and federal agencies. An average of 2.1 resources were used to answer each request. Because of the number of resources used in each request and the types of questions being asked, the actual research per request averaged slightly over one hour. This period includes only the actual time spent researching the request. The actual turn around time for each request (the time the request was made until a response was given) averaged 17.5 hours. This time period was reflected in the types of questions being submitted to the Telecommunications Information Network at the Telecommunications Office at the Health Sciences Library. Typical questions were:

"What are causes and preventative measures of arrhythmias after chest truama?"

"Are there criteria for release of patients from intensive care?"

"What are the adverse or positive effects of jogging or running on arthritis of the knee?"

"Are there written guidelines or procedures for handling patients with viral or infectious hepatitis in a hospital setting?"

It is very difficult to respond quickly to questions such as these that require in-depth research. As each request is taken, the requestor is asked how soon the information is needed. In cases where the information is needed immediately, all reference staff at the Health Sciences Library help research the question. Although there have only been a few such questions in 1979, all were answered within one hour.

TABLE 5

Resources Used for TIN Requests*

Resources	N	%
Book	47	39.2
Journal	52	43.3
Human	14	11.7
Other	7	5.8
Total	120	100.0

* Data based on a sample of 57 requestst.

Two of the site hospitals, Brown County General Hospital and Mercy Hospital North are equipped with hard-copy printer units. These hospitals have the capability of making hard copies of transmitted information. This is particularly valuable in light of the fact that 84.7% of the requests were made through the facilitator and not directly by the information user. One of the objectives of this project is to determine the effect of the hard-copy printer on the use of the Telecommunications Information Network. The hospitals with printers account for approximately 60% of all Telecommunications Information Network requests although the printers are used 100% of the time responses are made via slow-scan television. There is also no significant difference in the amount of slow-scan television use between hospitals with and without printers.

The search to find variables related to the use of the system requires a closer examination of the characteristics of the four hospitals. The heaviest user of the system is Mercy Hospital North. The facilitator at this hospital is a librarian; the equipment is located in the library which is in a separate building from the main hospital. The facilitator at Bethesda North Hospital is also a librarian; the equipment is located in the library which is located in the hospital. At Clermont County Hospital, the facilitator is a pharmacist; the equipment is located in the Pharmacy along the main hallway of the hospital. At Brown County, the facilitator is the Education Coordinator; the equipment is located in a room used for viewing various audio-visual resources which is also in a central area of the hospital.

The location of the equipment with respect to system users does not appear to be a factor in the system's use, since the hospital where the equipment is farthest from the users also has the highest use. Another possibility is that those hospitals with established libraries are going to experience greater use of the network because information-seeking behavior of hospital staff has already been established. Two hospitals with well-established libraries are Mercy Hospital and Bethesda North Hospital. Clermont County Hospital does not have a library of any kind and Brown County General Hospital has an extremely outdated collection. The hospitals with well-developed libraries account for over 65% of all Telecommunications Information Network questions. These hospitals make up only 50% of the requests which used slow-scan television in the response. The third and most plausible explanation for differential use of the Telecommunications Information Network is the size of the hospital. It proved very difficult, however, to identify exact numbers of health-care providers at each hospital. The 1979 edition of The AHA Guide to the Health-Care Field provided the following statistics:

Bethesda North Hospital	234 beds	572 personnel
Brown County General	132 beds	207 personnel
Mercy Hospital North	300 beds	832 personnel
Clermont County Hospital	63 beds	225 personnel

The number of personnel, however, does not include interns, residents, or other non-paid health-care providers. Bethesda North Hospital and Mercy Hospital North are each part of two hospital complexes which share medical and dental staff, and thus it is particularly difficult to identify staff associated with a single hospital location. With the knowledge that these statistics may not be totally accurate, it still appears that the hypothesis is supported. There is a perfect correlation between the number of personnel as stated in the AHA Guide to the Health-Care Field and the number of requests received from each hospital.

In a sample of 101 requests, 43.6% (44) were answered using slow-scan television. The remaining were answered either via telephone or through the use of an interlibrary loan or a computerized bibliographic search. Interlibrary loan and computer responses were mailed to the requestor. Table 6 breaks down those requests where slow-scan was not used to respond to the question and details other response modes used for those requests. Since the interlibrary loan network between the four site hospitals and the Medical Center Libraries existed before this project as a means of requesting specific types of information or journal articles and books, interlibrary loan requests rates at these four hospitals are examined over a two year period to determine if the Telecommunications Information Network had an effect on lending rates.

TABLE 6
TIN Requests Where Slow-Scan Was Not Used

	Bethesda	Brown	Clermont	Mercy
Additional Services Requested[1]	8	0	5	3
Equipment Problems	0	4	0	0
Receiving Library had Reference	1	0	0	3
Answer Given over Phone	10	0	1	12
Nothing to Send[2]	5	1	0	2

[1] Additional services include on-line computer articles or interlibrary loan requests. In cases where entire articles are requested, an interlibrary loan request is automatically assumed since to transmit an entire article via slow-scan would violate Medical Center Libraries' policy.

[2] In cases where there was no information to send, there may not have been any available on that request or further information was needed before the request could be answered.

Table 7 shows that, in general, lending patterns have not significantly changed. The exception is Clermont County Hospital which increased from zero requests in the 1978-79 period to 10 requests in the 1979-80 period.

(It should be noted that all these requests were made between October and December of 1979.)

The apparent increase in interlibrary loan requests by Bethesda North Hospital can actually be explained by a change in procedure by the Bethesda Hospitals. In the 1978-79 period, all interlibrary loan requests went through the Bethesda Base Hospital, resulting in zero requests from Bethesda North Hospital. In May, of 1979, Bethesda North Hospital began processing its own interlibrary loan requests, resulting in the apparent increase.

The drop in interlibrary loan requests at Brown County General Hospital can be explained primarily by administrative policy regarding interlibrary loan at that hospital. During the 1979-80 period, they were made from September to December 1979 with zero requests being made in the first three-quarters of that year.

TABLE 7

Interlibrary Loan Statistics For Site Hospitals

Hospital	4/78 - 3/79	4/49 - 1/80
	(Total No./Ave. No. Mo.)	
Brown County	23/1.9	13/1.3
Clermont County	0/0	10/1.0
Bethesda North	0/0	48/4.8
Mercy North	55/4.5	47/4.7

Some Limits to the Technology

After the network became operational, two limitations of the technology became apparent. The first involved the amount of printed information that could be sent in a single slow-scan transmission. After some experimentation it was discovered that in order to produce a readable image the print had to be unusually large. The maximum amount of information which could be transmitted successfully was approximately 3 to 4 paragraphs or one quarter of a page. This varied with print size. This required many more slow-scan transmissions per request and proved to be bothersome to both the requestor and the project staff.

The second problem involved the quality of the copies produced by the hard-copy printer. The printer (Tektronix Model 4632) produces heat-developed copies of the composite video signal. The heat-developing requires the printer to be warmed-up for a period of at least 10 minutes before use. This presents difficulties because the equipment is generally left turned-off until needed and it is often impossible to determine the exact time a response will be slow-scanned to a hospital site. The quality of the copies are generally poor. Often two or three copies of the same picture must be made to produce one that is readable.

Discussion

For the first year of this project, there were no goals expressed for the amount of use this network should receive; however, it is felt that the Telecommunications Information Network is underutilized. At its present rate, the network is receiving approximately 1.5 questions per day which is slightly less than two questions per week per hospital. There is no way to tell whether this present usage rate is going to increase, decrease, or remain stable. One possible explanation for present usage rates is the following.

Health-care providers must make medical decisions every day. Medical science is also undergoing changes in treatments and protocols on an almost daily basis. Based on these facts, it seems unlikely that the number of requests accurately reflects the actual number of questions in the target population. An individual with a question weighs the need to know against the costs, both in time and effort, in finding an answer. Some methods of seeking information, such as asking a colleague, require very little effort and represent a very attractive means of information seeking; other methods of seeking information such as library research require large amounts of time and effort and are correspondingly unattractive. When the need-to-know arises an individual seeks answers beginning with the easiest and most available sources, i.e. colleagues, and continues on to the more time-consuming resources until the question is answered or the consequences of not knowing are less than the costs of seeking the information. Because of the anticipated time and energy involved, the Telecommunications Information Network is probably perceived as a less attractive means of finding information.

The type of question that is likely to be put to the Telecommunications Information Network is one that is perceived as important, and the information was not available from other resources. The question is likely to be complicated, requiring a number of library resources, and not needing an immediate response. Most of the requests made through the Telecommunications Information Network fit this profile. The network was originally set up to handle the quicker, less time-consuming question; however, most questions of this type were probably answered through other available resources at each hospital site. This does not nullify the work of this network; rather, it identifies a different kind of need than was anticipated.

Future Considerations

In view of the changes in the type of request being submitted to the network, questions are raised about the method used to provide the information. It is clear, from past research and the preliminary evaluation of this network, that slow-scan television is just one alternative. Because of the depth of questions being asked and their non-emergent status, the speed of the response is less crucial.

One alternative, which some of the requestors have used, is the interlibrary loan system in which entire citations are photocopied and/or monographs are sent through the mail. The requestor receives the material in 5 to 7 days. This would be an adequate method for satisfying needs of personal information, but would be ineffective in dealing with questions aimed at patient treatment.

Since there seems to be heavy use of the printers at the hospitals that have them, another alternative might be a sophisticated tele-facsimile network. This type of network provides the speed of slow-scan with the ability to produce hard-copy prints, such as interlibrary loan. Some of these systems cannot transmit directly from a bound journal or monograph, which creates an intermediate step of photocopying the original and then transmitting the photocopy. This results in unclear copies and is costly.

None of these problems are insurmountable, however, they point to the most important issue to be addressed: providing the most efficient and effective system to meet the needs of the isolated health-care provider. While not providing all of the solutions, the Telecommunications Information Network has identified some of the problems of providing information services to this population. Extensive research is still necessary, not in the development or more sophisticated technology, but in the appropriate application of existing technology.

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A DESCRIPTION AND EVALUATION OF A TEN-STATION, HIGHLY UTILIZED, TWO-WAY TELEVISION HEALTH NETWORK

Jack Pfitzer
Communications Management Specialist
and
William F. Gust, M.D.
Associate Chief of Staff for Education
Veterans Administration Medical Center
Omaha Nebraska

The Nebraska Veterans Administration Television Network (NEVATV) is a broadband, interactive, medical television system. Ten health locations in Nebraska are served by this 12-year-old network. All sites can originate and receive programming. During any transmission participants can both be seen and heard as well as converse with the presenter or any other viewers on the network.

This paper is divided into the following topics: 1. Evolution: Beginnings to Present Day. 2. Functional Operations. 3. Philosophy and Service Objectives. 4. Utilization Data. 5. Findings of 1979 Evaluative Survey. 6. Future Directions.

Evolution: Beginnings to Present Day

The NEVATV Network was officially organized in 1968. However, the real beginnings of interactive television in Nebraska and, possibly the United States, can be traced to a two-station link initiated in 1964 between the Nebraska Psychiatric Institute of the University of Nebraska Medical Center in Omaha and the Nebraska State Hospital in Norfolk, 112 miles northwest. A $480,000 grant from the National Institute for Mental Health supported this interconnect.

Instrumental in the organization of this pioneering telemedicine system were two persons at the University of Nebraska Medical Center: Cecil L. Wittson, M.D., director of Nebraska Psychiatric Institute, and later chancellor of the Medical Center, and Reba Benschoter, Ph.D., Director of Biomedical Communications. Dr. Benschoter, a distinguished leader in interactive video, was responsible for much of the research and original experimentation in instructional two-way television.

The NPI-Norfolk circuit was established to give Norfolk's three psychiatrists access to neurologists and other specialists in Omaha. The link also served as a teaching medium and for family-patient visits. This first interactive medical hook-up was utilized for six years.

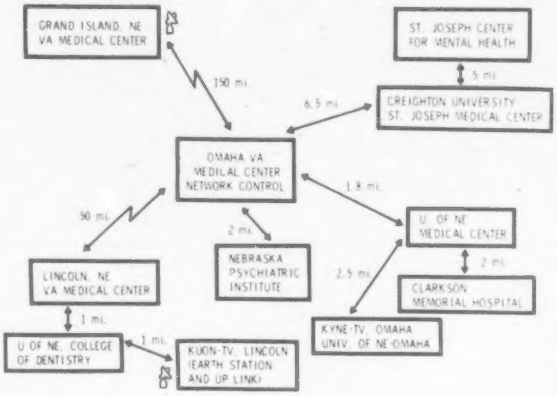
In 1969 an Exchange of Medical Information (EMI) grant from the Veterans Administration to the University of Nebraska Medical Center provided the resources to form the nucleus of the NEVATV Network.

The initial lines linked the Nebraska Psychiatric Institute with the Omaha VA Medical Center (OVAMC). In 1969 VAMC's in Lincoln and Grand Island joined the network. Later in 1969, the network expanded to the Biomedical Communications Center of the University of Nebraska Medical Center.

In 1973 the University of Nebraska College of Dentistry in Lincoln joined the system. One year later the Creighton University School of Medicine's teaching hospital, St. Joseph's, became a network member through an additional EMI grant.

With the cooperation of the University of Nebraska and Creighton University, three private hospitals maintain access to the network. They are Bishop Clarkson Memorial Hospital, St. Joseph's Medical Center, and St. Joseph's Center for Mental Health.

NEBRASKA VETERANS ADMINISTRATION TELEVISION NETWORK


GRAND ISLAND, NE
VA MEDICAL CENTER
ST. JOSEPH CENTER
FOR MENTAL HEALTH
150 mi.
5 mi.
6.5 mi.
CREIGHTON UNIVERSITY
ST. JOSEPH MEDICAL CENTER
OMAHA VA
MEDICAL CENTER
NETWORK CONTROL
1.8 mi.
50 mi.
2 mi.
U. OF NE
MEDICAL CENTER
2 mi.
NEBRASKA
PSYCHIATRIC
INSTITUTE
2.5 mi.
LINCOLN, NE
VA MEDICAL CENTER
CLARKSON
MEMORIAL HOSPITAL
1 mi.
KYNE-TV, OMAHA
UNIV. OF NE-OMAHA
U OF NE, COLLEGE
OF DENTISTRY
1 mi.
KUON-TV, LINCOLN
(EARTH STATION
AND UP LINK)

Interconnecting the network facilities are two-way video and audio signals carried on lease arrangements with Northwestern Bell and The Lincoln Telephone Company. Broadband signals are distributed via land lines in Omaha and microwaved to the outstate sites. The phone companies provide all maintenance services relative to the network's signals. Transmission rates have remained constant since 1969, and now are approximately $9,500 monthly. Although the VA has funded most of the line lease costs since the network's beginning, this arrangement is being reevaluated.

The network is designed with a central switching and control point located in the Omaha VA Medical Center. Signals from all other stations are routed through this point to reach their destinations. With the exceptions of the School of Dentistry, Clarkson Hospital, and St. Joseph's Center for Mental Health, any combinations of two or more stations may transmit and receive audio and video simultaneously resulting in four separate and private interactive programs.

Functional Operations

The main control center is located at the Omaha VA Medical Center. All programs, regardless of site of origin or number of receivers, are routed through this control center. An unique, sophisticated routing switcher connects all stations for system wide conferencing or a maximum of four individual two-way programs. Any station may originate programs.

The three VA stations use conference room studios for origination. At the Omaha VAMC the origination room seats 40 with switch activated microphones at the desks. Four large color monitors show the network program. The leader of a conference at the VA can view three small monitors that show the viewers at other sites.

Two cameras in the studio are focused on the speaker and the viewers. Overflow crowds can go to receive-only sites in a number of conference rooms in the hospitals. There is also another origination studio at the Omaha VAMC so that two programs can originate at the same time from this hospital. The second studio, located 8 floors above the main control center, is operated by a remote controlled black and white camera.

The Omaha VA network studio is equipped with the following conference use accessories: an eraseable writing board that accepts magic marker-type colors; projection screens; slide projector with presenter access to remote controls; carbon arc projector for pathology slides; over head projector; and an electronic matte keyed pointer.

Available in the control room are video cassette players with time based corrector, a character generator with 300 page memory, special effects generator, audio player and recorders, and a film island with 16 mm film projector and an additional 35 mm slide projector.

At least one person is on duty for all Omaha originated programs. The operator can manipulate one studio camera from a sliding window access port. He switches among participating stations, operates the camera iris, shading controls, special effects generator, character generator, videocassette recorders, and film chain.

Three persons staff the main control center: A network manager, chief engineer, and operations coordinator. The operations coordinator schedules all programming and prints weekly viewing guides. He gathers and summarizes monthly utilization data, and coordinates hourly programming activities.

There is currently an average of 65 program hours on the network each week. Programs are scheduled six days a week with evenings utilized for special offerings.

A priority system is used to determine which programs will be included on the network schedule. The established categories, in order of priority are: 1. Direct patient care. 2. Consultations - professional to professional. 3. Education - professional, graduate education, allied health, administrative training. 4. Administrative.

During a normal week about 11 percent of programming is direct patient care; consultations are not regularly scheduled but can preempt programming as needed. Education accounts for nearly 85 percent of the schedule; the remaining hours are administrative.

A weekly guide to all programs is mailed to interested staff and participating stations. It lists program times, titles, topics, participants, originator, and credit availability. Special programs or those with a topic of high potential interest are publicized by separate mailing or special inserts.

Requests to present a new program are channeled through the network manager. The network members have designated the Associate Chief of Staff for Education at the Omaha VA to make recommendations on the addition of new programs.

Additional programs in 1979 included more than 60 hours of satellite transmissions. The network has access to satellite earth stations in Lincoln or Grand Island and from there the broadcast can be routed to all stations. Programs have included those sponsored by the American Hospital Association, American College of Physicians, American Dietetics Association, and the Medical University of South Carolina.

The NEVATV Network has a policy making committee called the NEVATV Consortium Council. Membership is comprised of the directors of the biocommunications or television centers at all facilities, plus representatives of the medical staff at the member hospitals. Consortium chairman is the Associate Chief of Staff for Education at the Omaha VA.

The consortium meets once each month to discuss network activities: New programs, utilization, policies, changes, evaluations, and problems.

Philosophy and Service Objectives

Interactive television or teleconferencing is an innovative approach to remote communications. However, interactive television is no longer a startling and unstudied innovation. Its potential usefulness should be considered in terms of operational management rather than experimental research.

The medium allows senders and receivers to participate in visual and oral transactions that can approach face to face communications.

The health field potentially offers a wide variety of interactive television applications, ranging from classroom instruction to emergency medical diagnosis. The success on any one system cannot be measured solely on utilization records but rather on the adoption and commitment of the individuals and institutions who consistently experience interactive television.

The NEVATV Network was founded on the premise that patient care will be improved with the availability of many sources of medical information. Doctors at rural locations such as Grand Island, could benefit from immediate access to specialists at university medical centers. Mental patients in outstate areas would not have to be transported to mental health centers if the psychiatrist could meet directly with them over television. Health professionals, with huge scheduling demands, and continuing education needs, could make maximum use of their time if medical conferences were accessible at multiple local points.

Administrators would save travel costs and time if they could meet live via television and still remain in their own hospital.

Thus, four areas -- direct patient care, physician consults, continuing education, and administration -- were expected to be the services that the network would most benefit.

Because of the VA funding of the Network, originally through Exchange of Medical Information grants, objectives and philosophy necessarily reflect VA interests and needs. Rural VA sites require certain medical specialists and information that are not always immediately available. This need resulted in the links with state and private medical schools. ~~A~~ network was one way to tap the vast experience and specialized resources of the medical centers.

In addition, because of the resident and student placement in VA hospitals as well as dual faculty appointments, a network would facilitate classes, case studies, and interactive conferences like grand rounds.

Since 1968, an essential objective of the NEVATV Network remains unaltered: The NEVATV Network shall exist to promote the exchange of expertise and knowledge among medical, nursing, allied health, and administrative personnel with the ultimate goal of improved patient care.

As early as 1962, before the word "network" was even used, the following goals were suggested in VA and UN Medical Center discussions: A two-way communications link will promote cooperative teaching, clinical services, and research programs; it would also demonstrate and develop the use of modern communications techniques as a means of extending a medical center's capability to remote installations.

Six years later, when the NEVATV Network was officially established additional interactive philosophy was noted: "It may be difficult to divide service and education benefits for such a network in a clear manner. The majority of services we plan involve educators, and it is reasonable to assume that even the most insignificant service might, in some way, also have educational merit. In addition, essentially all the professional staff at the Omaha VA are faculty members of one or the other medical schools. There, academically oriented individuals will provide the greatest amount of what could be categorized as service." (Untitled document 1967 anon.)

The following programming services were expected to be the main uses for fulfilling network objectives: 1. Instantaneous consultation between patient and physician. 2. Electrocardiographic and x-ray interpretation. 3. Access to medical school and hospital specialists. 4. In-service training.

Consider how these services were defined and their level of use eleven years later. Today, "instantaneous consultation" remains a vital service for the network's existence. Although representing only 11 percent of the 65 hour total of weekly programs this program is essential for the Grand Island VA Medical Center where there are only 13 full time physicians and no psychiatrist. Nebraska Psychiatric Institute, which can claim 16 years of network activity is the most active originator for this consultation.

In addition to NPI, an Omaha VAMC cardiologist consults for two hours each week with heart patients at the Grand Island VAMC.

Also singled out for high potential use in 1968 was electrocardiograph and x-ray interpretation. Today, there is no regular EKG programming on the network. However, at a monthly radiology case conference, as many as eight cases involving x-ray interpretation are examined. About twenty radiologists from hospitals in Omaha and outstate Nebraska make this one of the most popular and consistently attended network programs.

Cited with high expectations was the general claim that access to medical schools and medical center specialists will be a service that can not be as easily achieved in any other medium. It was felt that an increase in "professional acumen" of hospital staff at rural locations would be reflected in improved patient care and a more competent group of physicians. The network was expected to be a potent source for continuing education. This area is difficult to measure but today medical professionals utilize the network weekly for continuing education credits. Each week nine hours of credit programs are regularly scheduled.

This is especially significant since Nebraska is one state where physician certification credits are not required for licensure.

Another area expected to draw high network use was inservice training, especially in the context of nursing and allied health. While a number of programs are offered, this is a category where the potential is yet to be realized.

In-service programs for nurses are not well attended during daytime shifts because of other in-house programs. In the past year, however, we have begun to address this issue through stepped up emphasis on nurses and allied health education. A number of night time courses have been presented with high attendance. Recently, 134 nurses attended a three hour conference entitled "Nursing Burnout". Credits are now available whenever possible. In addition a planning committee for nursing programming meets monthly with nearly 100 percent participation from all network members. In other medical fields, laboratory technicians, therapists, and social workers are also increasing their activity as they realize the economy of network utilization and the necessity of continuing education.

Network uses, in 1968, were also promoted to reduce costs. Savings were anticipated in these areas: 1. Fewer outside consultations. 2. More prudent use of laboratory and x-ray facilities with fewer repeated or unnecessary examinations. 3. Increased turnover resulting in decreased total per diem costs of patient care. 4. Increased therapeutic judgement (expected to reduce pharmaceutical costs). 5. More proficient nursing services. 6. Decreased transfers. 7. Reduced requirements for physician staffing. 8. Less travel costs to attend conferences, meetings etc. at participating network sites. Virtually all of these points remain cost-saving justifications today.

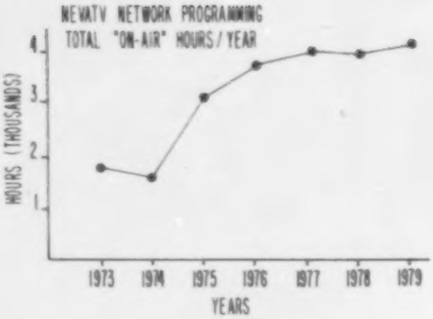
Other advantages to a highly utilized, viable teleconference network have emerged. These include increased access to specialists reducing the sense of isolation in rural locations, the network as an aid to recruitment of staff (especially in rural areas), and a general improvement in interpersonnel and interinstitutional relations.

Utilization Data

Utilization records for the NEVATV Network are available since 1973. Statistics for each hour of each program are reported. Programs are classified utilizing the four categories of priority noted earlier.

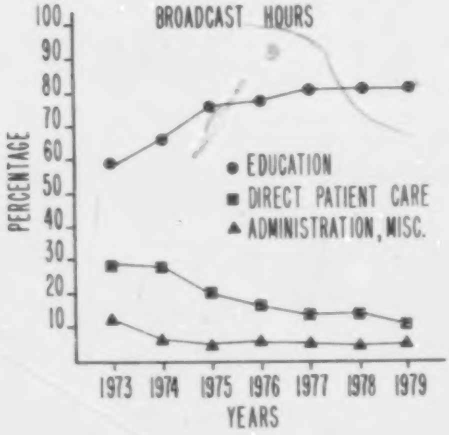
At each station, head counts are taken for every program. On a monthly summary sheet totals for types of participants (M.D.s, medical students, dentists, nurses, allied health, administrators) are collected by each participating station and sent to the network operations center. The following are utilization trends since 1973. Total number of network program hours per year has increased annually or stayed nearly the same with the exception of 1974. In 1973, program hours totaled 1,831. In 1974, the hours dropped to 1700, perhaps due to a more accurate monitoring system, but took a sizeable leap to 3100 in 1975, the first year of participating by Creighton University/St. Joseph's Hospital. Since 1975 broadcast hours have increased by 32 percent to 1979's total of 4106.

CHART 1



Network programming for education leads all categories in types of programs. In 1973, educational hours represented 60 percent of the total network output. This compares to 29 percent for direct patient care and 12 percent for administration in 1973. Time devoted to education has increased yearly since that year while the percentage of direct patient care and administration uses has decreased. Since 1977 education has stayed at the 83 percent level, patient care has averaged 12 percent, and administration 5 percent.

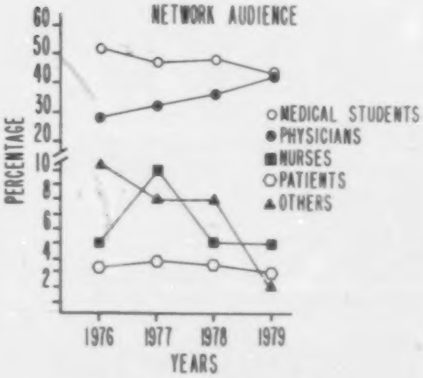
CHART 2



It is important to note that patient care is indirectly served by all types of education. Additionally, direct patient care hours have not declined over the years. The percentage changes are reflected in the large increase of hours devoted to education.

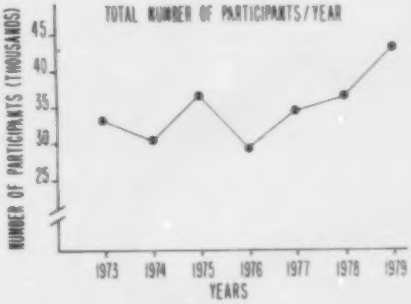
Audience classification records are complete since 1976. The highest number of users are medical students. In 1975 students accounted for 52 percent of the participants. In 1979 medical student use was at 43 percent. Medical doctor participation has increased from 27 percent in 1976 to 42 percent in 1977. Nursing usage was 5 percent in 1976; up to 10 percent in 1977 but back to 5 percent in both 1978 and 1979. Patient numbers have always been at the 3 percent level.

CHART 3



The total audience in number of participants per year has increased 30 percent since 1973. Total participants were 33,780 in 1973 and 43,354 in 1979.

CHART 4



Findings of 1979 Evaluative Survey

In September, 1979, during the twelth year of the NEVATV Network, a system wide evaluation and needs analysis were conducted. Because a survey of this scope had not previously been conducted for the network this included some exploratory measures. Although the conclusions may be tentative and incomplete, this survey will lay the groundwork for more refined network research and utilization.

There were 198 responses from about 400 medical and health employees surveyed at seven network locations. Most responses were from network users. Each health profession was represented in the survey: 55 medical doctors and residents, 5 dentists, 103 nurses, 10 medical students, and the remainder from administrators and allied health personnel.

From the survey an overall impression and attitude toward the network emerged. Ideas for new programs were generated.

The first entry asked respondents to choose the programs "important enough to you to warrant their continuation". Twenty-two programs were listed on the survey form. The mean number of programs checked by the respondents was 6. The number of programs most often selected was 4.

Conclusions are difficult from a ranking such as this. Although some programs were checked more often than others, this does not mean that the least marked program is unessential and should be dropped. Some network offerings are necessarily intended for a tightly targeted audience such as the Radiology Case Conference. Yet, these programs are attended regularly by nearly 100 percent of the qualified personnel.

Still, it may be of interest to at least list the five programs most often checked: 1. Internal Medicine Grand Rounds. 2. Nursing Continuing Education. 3. Digestive Disease and Nutrition Conference 4. Infectious Diseases Conference. 5. Internal Medicine Chief's Rounds.

Not all these programs, however, have an equivalent high ranking in attendance. Nursing Continuing Education has a low number of participants although it is offered at the time most nurses said is convenient, 2:00 - 3:00 p.m. on Wednesdays. Evidently, nurses recognize the program's potential value but have difficulty being excused from regular duties. A program not picked often on the survey, but ranking number 3 in attendance is "Introduction to Internal Medicine", a daily network class for medical students.

In another survey question, almost all respondents said they have participated in network programming. One-third of those responding attend network programs each week. When asked how the users become aware of network offerings 53 percent noted the weekly network schedule, while 24 percent learnof the programs through another person.

Perhaps question five dealing with network user attitudes was the most revealing. There were six parts relating to nature, format, and network performance. For this paper, the responses are listed as percentages according to which third of the continuum the check mark was placed. The entire groups' percentages are given first then divided into professions.

5.a. Is it important to you to receive Category I credit for network participation?

	not important at all	somewhat important	extremely important
TOTAL	26%	31%	43%
M.D.	44%	36%	20%
Nurses	7%	27%	65%
Allied Health	48%	34%	17%

Nurses have the most need for continuing education units because their re-certification requires it. Consequently, nursing programs for credit are increasing and are being offered in evening hours when off-duty nurses can attend. Response has been excellent to this move.

Physicians in Nebraska do not yet have a required continuing education for relicensure so less emphasis for credits is seen in physicians responding to this survey.

Question 5.b. is a follow-up on education credits. Of those responding, 60 percent desire additional credit producing programs.

Program satisfaction, as addressed in question 5.c., is highest with the medical doctors and medical students. As noted earlier, those groups have the largest numbers of users. In another profession, nursing, 77 percent responded that program content is "occasionally useful". Hopefully, program satisfaction will increase as nursing programs are offered more frequently during evening hours. Also, the network will try to offer more specific programming for the allied health personnel, a group with its own continuing education needs.

5.c. How well does the current content of network programming meet your needs?

	completely fails	occasionally useful	frequently helpful
TOTAL	7%	61%	32%
M.D.	2%	42%	56%
Med. Student	0	10%	90%
Nurses	5%	77%	19%
Allied Health	25%	71%	4%

Question 5.d. asks for an attitudes towards the essential feature of interactive television: The capability of two-way access where the presentor is not only seen and heard but can be questioned and engaged in a dialogue with a viewer eleswhere on the network.

5.d. How critical a function is the interactive capability of the network?

	little utility	some utility	one of most useful aspects of network
TOTAL	2%	33%	65%
M.D.	0	22%	78%
Med. Student	0	36%	64%
Nurses	3%	46%	51%
Allied Health	3%	31%	66%

The interactive feature of the network is highly regarded in every group. This can be emphasized by observing tape-delayed playbacks of a previously live network program when schedule conflicts do not permit a station to receive a program live. The resulting attendance numbers are markedly lower than if the program is available live at every station.

Question 5.e. explores the technical quality of the televised picture from the network. Just over half or 52 percent of the respondents indicated the picture technical quality to be "generally satisfactory, usually fine.". Only 11 percent cited "annoying". This is one question that does not lend itself to clear conclusions. The question would have been better stated if the technical classifications were subdivided into specific areas each requiring a separate response, i.e. sound, visuals, camera movement, picture sharpness etc.

Question 5.g. was intended to rate the overall programming in terms of organization and coordination. The positive attitude reflected here is a direct commendation to the presentors and the individual groups' internal organization.

5.f. How do you rate the (network) productions in terms of time use, organization, etc.?

	unplanned uncoordinated	some disorganization	well planned coordinated
TOTAL	26%	31%	43%
M.D.	2%	26%	72%
Med. Student	0	0	100%
Nurses	2%	24%	73%
Allied Health	4%	35%	55%

When asked in question 6 to rate preferred times for network participation, respondents overwhelmingly chose noon to 4:00 p.m. This is consistent with the most used hours of network activity.

Questions 7 and 8 were open ended and asked for individual input. From question 7 a number of new programs are under consideration and involvement is being sought. Among new programming ideas mentioned more than once were: medical/surgery programming, geriatric medicine, death counseling, stress management, management topics, and communications skills.

Question 8 asks for suggestions to improve network programming from a cosmetic or technical viewpoint. Among the suggestions: more clarity in slide and written visuals, presentor rehearsal, publication of the schedule a week or more ahead of program, and more access to video tapes of live conferences.

Future Directions

Moving into the '80's we believe the NEVATV Network will continue to enjoy high participation and provide more diverse programming to meet the needs of the health audience.

In addition to the new trends discussed below telecommunications can be part of the answer to the economic problems of limited travel budgets and increasing energy shortages. A concentrated effort in promoting use of telecommunications could result in fewer trips without decreasing educational effectiveness.

The NEVATV Network, based on the responses from the needs analysis survey will seek to offer new programming in these categories: Surgery, tumor board, radiology technicians, nursing continuing education, and management approaches.

There will be emphasis in further expansion to evening programming to reach more participants with varied work schedules.

Satellite broadcasts of national live health conferences and topics have proven successful in reaching a large network audience and more numbers of state-wide participants. These programs have served as an introduction to our network for many. As transmissions are made available, this type of service will be promoted for network use.

Another possibility for the NEVATV Network is the procurement of our own distribution system. During the next few months microwave ownership will be researched and explored. Although a high initial investment is required, cost accounting an owned and operated system over a few years may match the current charges for lease line arrangement.

Additional network members, especially in the Omaha vicinity, are a strong possibility. With cablevision moving into Omaha the various hospitals are working together in an effort to include two-way cable links among all health institutions. The interest in this has been encouraging both among cable franchise applicants and the hospitals.

Finally, by 1985 the NEVATV Network will operate out of a new system control center at the Omaha VA Medical Center. A new education wing to the hospital has been approved with one floor devoted to health telecommunications and the NEVATV Network.

Telecommunications among nine health institutions in Nebraska is a proven and successful resource. The regular users of the network and the cooperation of the participating facilities all contribute to the effectiveness of two-way communications. The users are the catalyst for this network and their continued creativity and careful utilization will insure that the NEVATV Network contributes to improved patient care.

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ALCOHOL FOLLOW-UP COUNSELING VIA INTERACTIVE TELEVISION

Robert L. Vinikoor
and
Jacques Perrault

Veterans Administration Medical and
Regional Office Center
White River Junction, Vermont

Summary

This study reports on providing alcohol follow-up counseling via interactive television. It describes the establishment, operation and evaluation of the program. Patients participating in the study are volunteers who have been discharged from the White River Junction, Vermont Veterans Administration Medical and Regional Office Center Alcohol Rehabilitation Program.

Introduction

"About three million veterans suffer from alcoholism, the number one health problem in the Veterans Administration Hospital system."[1] National Institute of Alcohol Abuse and Alcoholism figures estimate that alcoholism generates a fifteen billion dollar drain on our economy each year. Alcoholism ranks with heart disease and cancer as a national health problem. With this overwhelming problem it is quite apparent why the Veterans Administration has made the treatment of alcoholism one of its highest priorities.

Treatment for alcoholism requires more than inpatient detoxification programs. An elaborate network of supportive services are required in a successful alcohol treatment regime.

One essential element of treatment is the need for follow-up counseling. Follow-up counseling is a requirement by the Joint Commission on Accreditation of Hospitals for program accreditation.[2] A direct relationship has been shown in numerous studies between participation in follow-up care and a patient's ability to maintain sobriety.[3].

It is because of the importance of follow-up care and the problems created by the energy crisis, a rural environment with limited public transportation and a finite resource of counselors and facilities that the use of interactive television became a prospective tool for providing this service. Further exacerbating the problem in Vermont and New Hampshire are the travel restrictions during winter months.

The White River Junction V.A. participates in INTERACT T.V., an existing two-way medical television network based at the Dartmouth Hitchcock Medical Center. This network was already in place and connected the V.A. with six other locations in Vermont and New Hampshire. Thus an existing communications network provided the basis for the follow-up program.

Demographic data on V.A. patients discharged from the inpatient alcohol treatment program shows population densities in each of these satellite locations. (See Fig. 1). It was hypothesized that there would be a significant saving of time and energy without compromising clinical care, by having these patients seen locally via television rather than having them travel to the one central facility in White River Junction. Thus with this overwhelming medical problem, compounded with the limitations imposed by the lack of public transporation, energy conservation and the importance of follow-up care, the project began.

Procedures

The first step taken in trying to implement a change in follow-up counseling was that of meeting with the alcohol treatment team and discussing various applications for Interact T.V. This was followed by a demonstration where a counselor and patient participated in a counseling session within our hospital in which they were in separate rooms connected only via T.V. monitors and cameras. This session allowed the alcohol counselors to get some direct exposure and also gave us an opportunity to video tape the sessions so that the entire alcohol team could view it and see for themselves the quality and nature of interactive T.V. counseling. Initially, acceptance by the alcohol counselors was unenthusiastic and significantly lagged behind patient acceptance. Eventually the staff agreed to participate although some retained reservations about the effectiveness of this approach.

The next step was that of changing the hospital policy to permit this new modality of care. A patient consent form was developed which also served as a scheduling reminder for patients in that it gave the patients a record of the time and location of their follow-up appointment. Scheduling of patients for T.V. follow-up was handled no differently than usual. When the alcohol counselors and their patients had determined what kind of counseling was desired, dates and times were scheduled by the unit secretary.

Prior to the beginning of counseling, one further meeting was held between the alcohol team and the INTERACT T.V. satellite location station managers. The cooperation of station managers is essential since they become the human contact patients have at their local T.V. sites.

Finally patients were informed of the possibility of being followed by two-way television after discharge from the hospital program. Informing the patients of television counseling took several forms. Television counseling was discussed by counselors as part of the general orientation session held during the inpatient stay. A written description of television counseling was included in the alcohol programs handbook distributed to all patients and an article describing television counseling was carried in a patient newsletter.

Once the above planning was completed, a T.V. schedule was developed from the already heavily used INTERACT T.V. system.

Clinical Features

Television counseling sessions were held either for individual or small groups. The patients followed had previously completed a minimum 21 day hospital program and had voluntarily decided to participate in the television sessions.

One perceived advantage of television follow-up is that it provides continuity of care. Patients can receive continued supportive counseling in their local community by the same counselors who worked with them during their hospital stay. This kind of close follow-up also lessens the chances of losing patients after discharge.

T.V. counseling, because of its convenience for the patient, is less disruptive in terms of time, travel and loss of work than conventional counseling in the hospital outpatient setting. Another facet related to convenience is that it allows patients to bring family members to follow-up sessions because of travel time and the resulting loss of work.

Interactive Television affects the counseling process in some additional ways. As suggested by Mc Luhan[4], television pictures because of the limitations of the technology require viewers to work harder in supplying the missing resolution and thus may produce a greater degree of viewer participation and attention. This higher degree of attention experienced in television viewing can also be explained in part by Park's[5] concept of frame tension in that it "sustains the focus of the interaction." Another unique television phenomenon is that of proxemics defined by Hall[6] as the distance people maintain in interpersonal relationships. The proxemics of the television counseling session are intrinsically different from those of in-person and face-to-face communication. The spatial distance is different and it is perhaps this increased social spatial distance experienced in Interactive T.V. that is perceived by the patient as being greater and therefore less threatening. This may account for the relaxed feeling patients reported, as well as their ability to discuss freely their most intimate problems. Park [5], hypothesizing on the change in spatial distance created by Interactive television writes "that the territory of the self is in less danger and does not need the kinds of defenses one erects in face-to-face settings." Another factor perhaps accounting for the success of this program was that of the alcoholic personality itself. The alcoholic personality is generally eager to seek out new experiences and television counseling fits this framework.

Recovering alcoholics or abstinent alcoholics, in our opinion, do not wish to remain in the same socio-economic level as that preceding their recovery. They have the courage and willingness to take risks and experiment with new ways of dealing with life. They are looking for new challenges, experiences to fulfill the void in their lives;

therefore the use of television leads to a new and helpful experience.

Evaluation

A questionnaire was developed to ascertain patient acceptance and perceived benefits of this form of counseling. This evaluation was done during one thirty-day period of the program and reports the findings from 40 patients. The results of the questionnaire are summarized in Figure 2. Ninety-five percent of our sample reported that being seen via television was easier for them than conventional in-person counseling at the hospital; however, if travel distances were not a problem, 45% of the patients would have preferred to have been seen in person, this leaves the remaining 55% of the patients still willing to be seen via T.V. even without travel restrictions.

Further data supporting the use of television counseling was that 82% of the patients surveyed felt that television counseling was as confidential as an in-person interview. This 82% figure is also remarkably high when considering that 80% of the patients reported that this was their first experience with two-way interactive television. All patients reported that T.V. counseling saved them travel time, the average time being 2 hours. This corresponded well to the average time saved from loss of work which was reported as 4 hours. Patients responding also indicated on a scale from 1 to 10 where 1 was very tense and 10 very relaxed, an average level of 8.5 while talking over television. This was supported by 99% of the patients reporting that they could ask questions freely over T.V. Some final data derived from the questionnaire indicated that 99% of the patients felt that they received as good a counseling session over television as in person, and 100% reported that they would continue to attend T.V. counseling.

A comparison between alcohol patients seen via television and those followed by conventional in-person counseling showed no significant difference in maintenance of sobriety.

Generally, the most outstanding benefit of this form of counseling was its convenience and cost effectiveness in providing services without extensive travel and loss of time from work. Of those 40 patients used in our sample for a thirty day period, approximately 4,351 miles were saved in travel and a total of 75 hours were saved by not having to travel. This savings is going to be increasingly more important in our society where energy conservation will be an ever growing problem. The energy consumed on the average from traveling 4,351 miles when figuring 20 miles per gallon equals 7,984 kilowatt hours as compared to the electrical consumption of microwave T.V. for this same period of 16 kilowatt hours.

Clinical Anecdote

Mr. A.P. started drinking at the age of 16. His drinking problem followed him into the service and after treatment for alcoholism on two occasions was discharged from active duty for an alcohol related problem. His drinking continued and he refused to participate in treatment programs such as A.A., V.A. inpatient alcohol rehabilitation program or other supportive groups. He is presently married, has two infant children, is employed as a maintenance person.

Mr. A.P. presented himself voluntarily June 1979 consuming a minimum of a 6 pack of beer a day with a suspended sentence of D.W.I. and being "sick and tired of being sick and tired." I discussed the feasibility of his admittance to the V.A. inpatient 21 day alcohol rehabilitation program which, because of financial responsibilities and employment considerations, was not a viable alternative.

We then decided to follow him via interactive television as a compromise for more intensive treatment. He continued to drink for the first 3 months but nevertheless reported for scheduled television counseling. His wife attended counseling sessions as well. He has maintained his sobriety since October 1979 to the present. His longest periods of abstinence prior to his television counseling had been 2 - 4 weeks. This radical change in his drinking behavior can be attributed to a multiplicity of factors. The most important is his own desire to maintain sobriety along with the commitment from his wife gained through an understanding she received through participation in the television sessions, and perhaps the convenience of a treatment modality such as interactive television which for the first time could mesh with this difficult individual's life style.

Conclusions:

As Park [5] has amply documented in his most complete compendium, Interactive T.V. is no longer an experimental entity, but in the past 20 years has become a communications medium in its own right. John Knowles, M.D.

in the preface to Parks' book states:

> "The major issues besetting the American people in the field of health are those of cost, quality, and accessibility of services. I have long been convinced that two-way television between urban medical centers and those in suburban or remote rural areas could do much to contain costs while enhancing the quality and accessibility of needed health services."

It is our contention that the use of Interactive Television in providing follow-up care to alcohol rehabilitation patients allows us to take an important step in this direction.

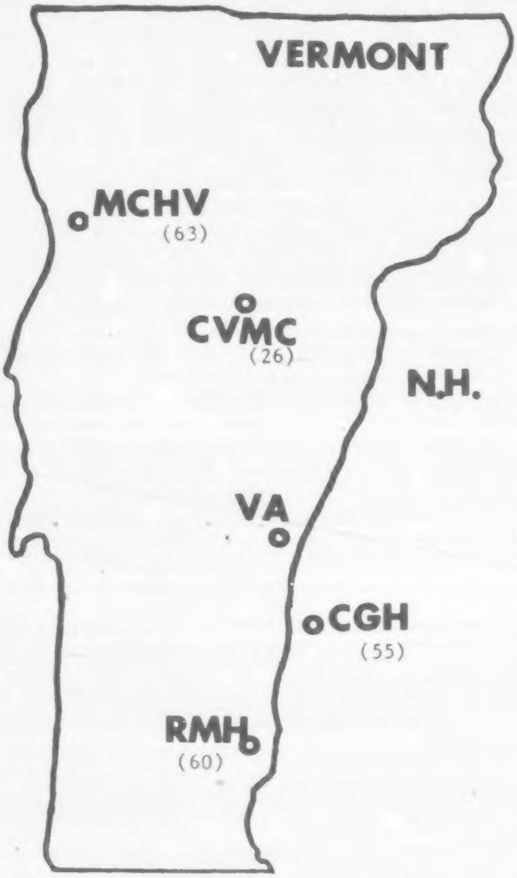

Fig. 1 INTERACT T.V. Locations used for Alcohol Follow-up and Patient Populations within 20 Mile Radius of Each.

1. Is being seen over T.V. easier for you than coming to White River Junction?
   Yes 95% No 2.5% Other 2.5%.
2. Did you feel your TV counseling session was as confidential as an inperson interview? Yes 82% No 15% Other 3%.
3. Did TV counseling save you from losing time from work: How much: 4.3 average hrs.
   Yes 88% No 12% Other ______.
4. Is it easier for you to bring family to TV counseling than to White River Junction?
   Yes 82% No 18% Explain Why __________
5. Do you feel your anonymity is compromised by being seen in your local hospital TV site? Yes 20% No 80% Other __________
6. Is anonymity important to you?
   Yes 25% No 75% Other ________________
7. Have you ever used two-way TV communications before: Yes 20% No 80% Other __
8. How far did you travel to get to the TV site? 430 total miles (one way).
9. Were you relaxed talking over TV? (Rate yourself below)
   Very tense - 1 2 3 4 5 6 7 8
   9 10 -Very relaxing (8.5 average).
10. Did you feel your counselor was giving you as good a session over TV as you would have received in person?
    Yes 99% No 1% Other __________________
11. Would you prefer to be seen in person if travel distances were no problem?
    Yes 45% No 15% Makes no difference 40%.
12. Did TV counseling save you travel time?
    Yes 100% No ___ How much: 75 hours total.
13. Could you ask questions freely over TV?
    Yes 99% No 1% Other __________________
14. Are you more likely to say things over TV that you wouldn't have said in person?
    Yes 3% No 86% Other 11%
15. Are you more likely to say things in person than you are over TV?
    Yes 36% No 58% Other 6%
16. Will you continue to come to TV counseling sessions? Yes 100% No. ___
    If not, why? __________________________

Fig. 2

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INTERACTIVE COMMUNICATION: IT'S IN THE MIND!

John S. Daniel and Martha A. Stroud
Athabasca University,
Edmonton, Alberta
Canada
T5L 2W4

Abstract

Distance education is a combination of interactive and independent learning activities performed by the student. Modern communications technologies can facilitate and extend both types of activity. However, no matter what the methods of instruction it is the processes occurring in the mind and brain which are paramount in learning. An examination of these interactive processes suggests guidelines for the conduct of distance education.

Introduction

The purpose of this conference is to explore the applications of interactive communications technologies in education. Most of these applications are found in the rapidly expanding field of distance education, a term which applies when learners and teachers are separated by distance and/or time.

It has been suggested [1] that the design of distance education systems is a search for an effective and efficient combination of independent activities (the student working alone) and interactive activities (contact with other people). Modern communications and computing technologies have facilitated both types of activity. Although this conference concentrates on interactive communications, technology has had an even bigger impact on the independent activities in many distance education systems. The British Open University broadcasts instructional programs to its 70,000 students on national TV and radio networks. This enables students to study the programs at home and also, as a by-product, 'opens' the University's courses to a large drop-in audience which has no formal link with the institution. At the author's institution, Canada's Athabasca University, the most significant technological advance in the last two years has been the introduction of computerized text-processing and typesetting in the production of printed learning materials.

In other institutions advances are being made in the application of technology in interactive learning situations. The Wisconsin Educational Telephone Network has served as a model for many other jurisdictions and interactive computing is now making headway in distance education. The papers at this conference examine these and other developments in detail.

Our purpose here is to explore in a general manner the role of interactive processes in learning in the hope of discovering principles which will help us provide effective distance education. Unless we constantly re-assess the conceptual basis for our actions we are likely to succumb to the common occupational hazard of educators and split into warring factions defending particular orthodoxies or techniques. To a degree this has already happened in distance education for there are now two rather different interpretations of the meaning and purpose of educational technology.

In one camp there are the instructional designers for whom educational technology simply means a systematic, rule-based approach to the design of teaching and learning activities. This camp holds no special brief for the use of media and concentrates on developing the software of education in an analytical manner. Although this approach has been successfully adopted in the training activities of many organizations there is still significant resistance to it in educational institutions, especially universities.

The other camp believes that educational technology is something that plugs into the wall. Its job is to increase the impact of the teacher with minimal disturbance to his acquired instructional habits. Many of the interactive networks discussed at this conference are expressions of this approach, which has had success in providing an outreach component to a number of campus-based institutions.

While each of these approaches has merit, both overemphasize teaching at the expense of learning. A closer look at the role of interaction in learning will make this clear.

Interactions and Conversations

To interact means to act on each other or to act reciprocally. In everyday usage the term interaction normally refers to conversations between people and the interactive networks discussed at this conference are designed to facilitate such conversations. However, the concept of interaction can be applied to the technology itself and the term conversation also has a more abstract meaning.

Interaction occurs when communication channels are connected. Much the biggest interactive machine in existence is the international telephone network. From our own telephone each of us can communicate with any one of millions of other subscribers around the world. The international switched network is undoubtedly the most versatile and powerful communications technology after the postal service -- and the combination of computing with telecommunications will probably soon put it in first place.

Even so, the intensity of interaction made possible by the world's phone system is insignificant compared to the interactions and connections that can occur within a single human brain. There are one hundred billion neurons in the brain and each one has a potential of connections of 10^{28}. In simpler terms, this means that if the theoretical number of potential connections were written out, the first figure would be followed by about ten million kilometres of noughts. The world's phone system is equivalent to a volume of brain tissue the size of a pea. This should remind us that the complexity of the interactions we can observe in any instructional event is insignificant in comparison with what is taking place in the mind and brain of the learner.

As with interaction, so the term "conversation" goes beyond the everyday meaning of a verbal exchange. Concept generating conversations can take place within a single human brain and the most complete theory of learning and cognition currently under development is called the theory of conversations, individuals and knowables.[2] An essential distinction in this theory is that between processors (e.g. a computing machine or a brain mechanism) and procedures (e.g. a role in society or a species). In these terms a conversation is defined as "a psychologically characterized individual (a self-reproducing class of procedures) that is executed in one or more of a restricted class of mechanically characterized individuals (processors)." If this definition sounds complex it should remind us that the reality of learning is undoubtedly complex too. Only recently, with the development of machines such as the positron emission transverse tomograph, can we even see the possibility of understanding the neurobiological processes which occur when a human mind converses with a complex domain of knowledge such as thermodynamics.

The Mystery of the Mind

Of considerable relevance to learning is the most mysterious interaction of all, that between the brain and the mind. So far science has made little headway in resolving the basic philosophical controversy around the problem of consciousness. The problem has been nicely expressed by Francis Crick.[3]

> "Recently I was trying to explain to an intelligent woman the problem of understanding how it is we perceive anything at all . . . . Finally in despair I asked her how she thought she herself saw the world. She replied that she probably had somewhere in her head something like a television set. 'So who', I asked, 'is looking at it?' She now saw the problem immediately."

If by the mind we mean that part of the individual which makes decisions as to the target of conscious attention and directs the programming of all the mechanisms within the brain then it is clearly of vital importance to learning. This is the case whatever view we hold of the relationship between the mind and the brain. Samuel Johnson pointed out that the true art of memory is the art of attention and this art of attention is of particular concern to distance educators.

Since the quality of distance education courses in terms of instructional efficiency is almost invariably superior to that of conventionally taught courses it is legitimate to ask whether the lesser completion rate of distance students is due to the difficulty of attracting their attention to the materials. Put in a more heretical way we may ask how many of the trappings of conventional education (corralling students in classrooms, assignment deadlines, secrecy about objectives and

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examinations, etc.) are devices whose main function is to engage the student's attention. Once the mind has chosen the course as the target of conscious attention learning seems to occur fairly well even if the interactions between brain and content are relatively inefficient.

This observation suggests that distance educators are in an unusual situation. In most domains of human activity technologies which allow people greater freedom and choice are preferred over those which impose constraints of time, place and association. The private motor car led people to desert the timetabled group travel of trains and buses. Home television sets emptied the cinemas. Yet when seeking education most people seem to continue to prefer the inconvenience of the scheduled class even when alternatives are available. Many freely admit that they 'need' the discipline of the classroom in order to do the work required.

Mental discipline and the use of time are, of course, two of the fundamental challenges of human existence. Time is the one resource that all men receive in precisely equal quantities. We all have twenty-four hours in each day. Yet in the effectiveness with which they manage and use their time men are very unequal. Time is of particular importance to busy executives and Drucker [4], in a study of executive effectiveness, states unequivocally that time management not only can be learned, it can only be learned -- and it must be relearned regularly by self-monitoring. In the context of education it is interesting that modern techniques for efficient learning, notably speed reading and the mapping style of notetaking, place more demands on the attention directing function of the mind than on any particular mechanisms of the brain. Promoters of these techniques such as Tony Buzan's Learning Methods Group also encourage demanding physical activity. Doubtless the aim is not only to increase aerobic fitness, and so improve the brain's functioning, but also to heighten mental discipline.

What can distance education do to help students use their minds and manage their time more effectively? When faced with this problem of basic learning skills the usual response of educators at any level is to lament that their colleagues at the previous level did a poor job but to disclaim responsibility for remedial action. In fact our educational systems devote little effort to inculcating advanced mental skills. A Chinese proverb states that if you give a man a fish he will eat for a day but if you teach him to fish he will eat for a lifetime. In these terms our public educational systems are distributing fish and leaving to private enterprise much of the teaching of fishing (through expensive courses on speed-reading and time management). Although it is doubtful whether educators have consciously eschewed mental skill teaching for fear that they would thereby lose a captive audience of dependent learners it is certain that distance education can only flourish if learners become independent and graduate beyond the servitude of spoonfed instruction. We shall return to the development of independence after looking at some features of the brain.

The Buzzing of the Brain

We have stressed the vast interactive complexity of the brain, for which Sir Charles Sherrington had an illuminative metaphor:

> "The human brain is an enchanted
> loom where millions of flashing
> shuttles weave a dissolving
> pattern, always a meaningful
> pattern, though never an abiding
> one. It is as if the Milky Way
> entered upon some cosmic dance".

Faced with this complexity, which enables the normal brain to make more patterned interconnections than there are atoms in the universe, students of human learning have, until recently, been at a loss to relate learning events to physical processes. The difficulties of studying the brain gave rise to the behaviourist approach to learning which, treating the mind and brain as a black box whose interior workings could not be observed, concentrated on measuring external stimuli and responses. While behaviourism has undoubtedly thrown some light on the conditions for learning it has also delayed progress by downplaying the role of the mind and the potential of neurobiological studies. However, increasing evidence of the power of the mind to alter physiological processes at will and advances in techniques for observing the brain at work are restoring a more balanced approach to learning research.

Of particular interest are the results of experiments conducted in the past two years with the positron emission transverse tomograph (pet, for short). This machine makes it possible to observe which parts of the brain are using energy when different types of thinking processes are occurring. Observations with a pet have confirmed previous indications about the left-right specialisations of the brain. When abstract, logical and verbal tasks are demanded the left hemisphere is active whereas visual and spatial problems provoke activity in the right hemisphere. A new finding was that left hemisphere activity is highly focussed in small regions whereas when the right hemisphere dominates activity is diffused throughout this half of the brain. This may be related to the different functions of grey matter (concentrated in the left hemisphere in lumps) and white matter (distributed diffusely in the right hemisphere). In another series of experiments it was found that listening to a story provokes more activity in the right hemisphere than in the left where verbal analysis takes place. Interpreting a story may involve more visual thinking than we realize.

While all these experiments are in their early stages and the pet itself is being continually refined to distinguish smaller volumes of brain, they do suggest explanations for some of the most intriguing observations of cognitive psychology. Of particular interest, given the distinction between the two hemispheres of the cortex, are those criteria on which people seem to divide themselves into two groups. Although the categories are not watertight the following dichotomies appear to have some usefulness in distinguishing the approaches of different individuals to cognition, perception and creation [5]:

serialist	vs	holist
successive	vs	simultaneous
readers	vs	listeners
restricted	vs	open
non-scanning	vs	scanning
sharpening	vs	leveling
field dependent	vs	field independent
conformist	vs	non-conformist
passive	vs	active
short term	vs	long term
impulsive	vs	reflective
analytic	vs	global
analytic	vs	functional
low cognitve complexity	vs	high cognitive complexity
classic	vs	romantic
quantitative	vs	verbal

Although we shall not explore here the nature of these dualisms and the evidence for them, a brief discussion of the first pair, serialism and holism, may be useful as an example. The serialist-holist dichotomy was revealed by Pask and Scott [6] who observed how individuals interacted freely with a new domain of knowledge. Subjects divided unambiguously into serialists, who formed simple hypotheses and moved through the domain in a step-by-step manner, and holists who formed hypotheses about complex predicates and moved around the domain quite differently. When linear instructional programs matching each of these strategies were developed for another domain of knowledge the importance of the distinction was reinforced. Subjects with a program matching their cognitive style (serialists with a serialist program, holists with a holist program) always learned the material almost perfectly whereas where program and subject were mismatched (holist with serialist program or vice versa) learning was always limited. Other differences emerged when the groups were asked to 'teach back' the material. Serialists kept to the order of their program while holists, although they taught in a coherent manner, usually rearranged the material. The weaknesses of the two strategies were also revealed, serialists failing to see the wood for the trees and missing useful analogies, holists tending to overgeneralize and make numerous unhelpful analogies.

The point about this dichotomy is that both extremes of pure holism and pure serialism are pathologies. Efficient learning should be versatile, combining the operation learning of serialism (logical combinations and extrapolations of relations) with the comprehension learning of holism (identifying analogies between sets of relations). As with many or all of the dichotomies on the above list, it seems reasonable to draw parallels between serialist and holist cognitive processes and the activities characteristic of the left and right sides of the brain. If these parallels are valid then the route to versatility - the ability to operate at will in the manner of either side of each dualism - lies through the balanced development of both brain hemispheres. We use the word development advisedly since it appears that the efficiency with which interconnections and interactions occur within the cortex depends largely on the demands made on the brain by the mind and the environment. The brain can respond in a versatile manner to these demands. Indeed, to a surprising extent, the functions of an hemisphere which is removed or damaged can be taken over by the other hemisphere [7]. Socioeconomic class and culture, along with age and sex, appear to influence the distribution of people between the two sides of the dualisms in our list. It is commonplace to explain differences in approach and behaviour between East and West by contrasting the organic style of one half of the world with the linear approach of the other. Similarly a recent article [8] explains the recent economic success of the post-Confucian Asian states by their roots in a philosophy which has always attached equal importance to knowledge and action. Education, directed toward both ends, is highly valued in these countries.

This brief look at the human brain has suggested that its enormous potential for interconnections requires development, through experience and learning, if it is to achieve even a fraction of its possible power and complexity. In particular it is essential to develop the capacities of both sides of the brain to obtain the requisite versatility for learning and acting.

It seems that we are back once again to the dilemma we reached in examining the role of the mind. On the basis of our review it is easier to generate prescriptions for the educational system as a whole, from the cradle onward, than to suggest how distance education should be conducted in a particular course on a specific topic aimed at a disparate group of adults. However, the effort must now be made.

Toward Independence and Interaction

Step one is to create conditions such that the learner directs his attention to the course. Many other activities in the adult learner's life are competing for his attention and he cannot be coerced to study. The most effective way to ensure that the learner attends to the course is to link the course to his own purpose in life. In other words it is important, before the course even starts, for the learner to understand clearly how success in the course will bring him nearer to the attainment of important life goals. These do not have to be career goals; strongly held educational or personal goals can also generate a sense of purpose.

This step sounds simple enough. However, distance educators must be prepared for the situation where the adult is unclear about his goals. An effective institution will provide counselling and planning assistance to help the adult achieve some clarity before encouraging him to choose and study a course.

Step two is to ensure that the student uses effectively those periods of time during which his mind decides to make the course the target of conscious attention. Such effectiveness requires certain skills in the student and certain features in the course.

For the student effective use of time means two things, planning periods of time for study and using these periods efficiently. The best way to begin planning time for study is for the student to monitor his use of time for a week, noting all activities and accounting for each quarter-hour. This log, which alone can be revealing, is used to identify a number of blocks of time (preferably of at least 90 minutes each) which total, on a weekly basis, the investment of time recommended for the course. Once this study timetable has been drawn up and, if necessary, negotiated with family and friends, it should be regarded as inviolate. Other activities must now be planned around it. The mind must provide the required discipline.

To use the assigned periods of study efficiently requires proper management of the time within each period combined with good use of the brain during study. Proper use of time is based on the recognition of two facts:

- learning is more efficient at the beginning and end of a period of study than in the middle

- recall rises during a short period immediately after learning

The practical import of these facts is that study is best organized in periods of 20-40 minutes separated by complete breaks of five minutes. Thus our 90 minute study block might best be divided as follows:

Study - 40 minutes
Break - 5 minutes
Study - 20 minutes
Break - 5 minutes
Study - 20 minutes

Having divided up the time it is useful to set study objectives for each period. These objectives can be readjusted but the effort of setting them helps focus the mind on the task at hand.

To increase the amount accomplished during each period of study various efficient learning methods [9] should be learnt and practised. These techniques are:

- Speed reading: more is learnt in several fast reads than in one slow read. This is probably because the concentration required to read rapidly increases the attention level and places more demands on the brain.

- Reviewing: recall, which normally falls off quickly after a period of study, can be maintained at a high level by short periods of review spaced approximately as follows after the study period: 5 minutes - 1 day - 1 week - 1 month - 1 year. Each period of review will be shorter than the previous one. For best effect the student should begin each review by making cursory written notes on what can be recalled of the topic.

- Notes: diagrammatic notes in the form of a 'mind-map' of keywords are more useful aids to learning and recall than extensive sequential notes written in full sentences. The spatial arrangement of mind-maps, which also lend themselves to coloring and artistic doodling, involves the right brain in learning.

These are skills which every student can and should acquire. To the extent that a student does acquire them he will be able to learn effectively in any situation, both independently and in a live or teletaught classroom.

Approaching learning from the point of view of the mind and the brain also suggests characteristics which should be present in any course we design. Some important guidelines are:

1. Divide the course into units corresponding to natural study periods.
2. State aims and objectives on which the brain can focus when studying each unit.
3. Associate new material with things the student already knows and show its personal relevance.
4. Emphasize key concepts and the relations between them.
5. Appeal to both hemispheres of the brain by combining visual and spatial images with a logical/sequential analysis.
6. Stress applications and extrapolations of the material presented.
7. Encourage the development of efficient study skills by the student.

Conclusion

These are very general guidelines - inevitably so since any domain of knowledge can be taught in many different ways. Some of the guidelines can be implemented very readily by the use of electronic media and interactive techniques. However, all can be implemented even in a simple presentation. When the course itself takes on much of the responsibility for making the content interesting, learnable and memorable it is even more important to consciously promote the development of independence in the learner. To carry on self-directed learning is the ultimate maturity required of the educated person.

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RELATING TELECONFERENCING TO ADULT EDUCATION:
TWO INTERNATIONAL EXPERIENCES

Andre' L. Delbecq
Dean
The School of Business
The University of Santa Clara
Santa Clara, California

Introduction

The Importance of Adult Learning

At the present time there are very few topics that evoke greater attention in higher education than the topic of adult education. There are a number of interacting reasons why adult education is a particular challenge for the 80's. First, there is economic imperative. Given the new realities of demography with decreasing student enrollments, and decreasing taxes for public education, universities are becoming increasingly sensitive to the potential of the adult learner as a new educational market. Second and more importantly, adult learning is a focal concern because of the realities of the knowledge explosion in our society. Whether in popularized literature such as Toeffler's Future Shock, or in examining specific career development literature associated with technical fields, there is agreement that a predominant concern for all professions is avoiding technological obsolescence. Knowledge is reproducing in the physical sciences about once every six years, and in the social sciences at only a slightly slower rate. As a consequence, the notion that individuals can be educated once and for all through pre-entry degree programs is clearly anachronistic. Finally, as our labor force grows older and as retirement laws provide increasing protection to older citizens, concern with retraining and updating education becomes a more important imperative.

Nor should one think of adult education as remedial. Studies at the Institute for Social Research in Ann Arbor indicate that the best and the brightest are likely to become rigid, repetitious, and mundane unless within any four year period new stimulus for rethinking is provided. Based on studies of successful scientists, engineers, and professionals current research literature indicates a need for constant emphasis on adult learning as a necessary and continual aspect of professional life in our society.

The purpose of this paper is twofold. First, I would like to present a brief summary of key principles of adult learning particularly as it relates to professional personnel. The second purpose is to show the intricate and important way in which teleconferencing has been built into adult learning in two overseas experiences--South Africa and Australia.

The Australian/South Africa Experience

Each country has made imaginative and creative use of proxy presence through telecommunication in ways that are worth serious consideration by both organizational training units and university educational efforts. Like many forms of innovation, necessity no doubt constituted much of the mothering. The Republic of South Africa and Australia are countries with relatively limited numbers of professional personnel disbursed over very large land masses. Unlike the American continent, universities or training centers of excellence are often remote from professional personnel. A mining engineer in the northern vaal, a radar technician in the outback, do not have the luxury of attending a program at a neighboring junior college or university. As a consequence, these countries were driven to considering modalities of adult education without the luxury of relying on classroom interaction as the predominant focus of instruction. Early attempts in both countries to conduct the conventional "correspondence" educational endeavors were unsuccessful. As a result, both countries have evolved innovative patterns of education through teleconferencing. I will summarize an "arctype" based on their joint experiences given limitations of time.

A Summary of Principles of Adult Learning

In 1978 I served on a committee studying models of adult learning at the University of Wisconsin-Madison. Our purpose was to ask what the implications of models of adult learning were for more traditionally programmed university curriculum. As a preface to the discussion of international experiences utilizing telecommunications as a specific technology in education and training it would be useful to step back and ask the questions: "How does the adult professional approach post-graduate education? What is his/her style of learning? What are the implications of adult learning for constructing an educational program?"

The predominant theme in all studies on adult learning, Androgogy, and training is that two characteristics underline the adult learner: (1) the adult learner is purposeful and (2) the adult learner is independent.

Adult learning as purposeful: The professional enters the learning situation predominantly to solve immediate problems. He is normally not returning to learning situations for general education, dor does he normally use adult education as a liberating approach to total growth. By and large, he relies on his pre-entry education as an orientation which allows him to pursue "liberal education" on his own. In this sense, one of the claims of liberal education appears to be reified in the behavior of most professionals returning to instructional situations. They do rely on their baccaleurate education to teach them "how to learn for life" in terms of general edification, mind expansion, and self-actualization.

What they do realize however, is a need for specific task related education that helps them solve problems that they are experiencing in their professional life. Because of this task focus, adult learning situations must convey respect for the learner's purposes, must help him approach resources in a manner that connects to his own task goals, and must be sufficiently flexible to allow for a multple and varied emphases and objectives among diverse learners. Rather than a generalized approach for an entire "class", adult education is rather perceived as a resource opportunity that can be drawn upon by varied students for multiple purposes with considerable reliance on the student himself to provide for diagnosis, learning objectives, and purpose.

The adult learner is Career Oriented: The secondary purposeful reason for entering the learning task is career advancement. In general because of the great demands on an adult's time the learner would like to be able to link his learning situation to organizational and professional standards and credentialling. He would like to believe that opportunities to return to an educational setting can be additive and over time can be reinforced through recognition not only by the educational organization but also by his professional group or organization.

Independence

The second major aspect of the adult learner is independence. While he seeks to learn interdependently and, indeed, prefers a style of learning that emphasizes dialogue and interaction, he would like to exercise substantial control over the character of the dialogue and his own place in the learning context. Unlike the pre-entry learner who sees the instructor as a role model, the adult learner does not necessarily perceive the instructor as a model. Rather, the adult learner sees the instructor as a resource person who can help direct him to learning materials, can cross check perceptions, can serve as one referral expert, can introduce him to other experts; but necessarily is only one of the resources in a learning situation. The adult learner feels that he can directly handle much of the learning material, is better equipped than the instructor to search the subject matter for his own emphasis and his own linkage to work situations. He likewise feels that self-evaluation and peer-evaluation are as important as instructor evaluation, given individual differentiated goals and emphasis in the learning situation. He is willing to assume responsibility for sharing in the teaching tasks, sharing in establishing appropriate goals and standards related to his learning mission, but wants to be sure that the learning situation is structured so that it relates to his life experiences, his organizational responsibilities, and those tasks and situations for which he will be accountable.

In summary, the adult learner does not come to the educational circumstance to be "taught". He comes to the educational setting (whether it's a professional conference or a university program) to utilize that setting as a resource and perceives a total set of resources that include himself, his fellow learners, as well as the instructor and materials that should be available for personally oriented and purposeful problem explanation as opposed to other directed general emphases.

Instructional Characteristics

Course Planning

The above learner characteristics clearly indicates that the style of education or training for the adult learner has to be different than the archtype classroom situation. It follows from our comments above that the emphasis on adult learning is to facilitate learning, not to impose a personal model or single modality of instruction on the learners. The people who come to the learning situation should share in goal setting, share in instructional tasks, play an active role in presentations, exercises, resource sharing, and problem analysis. This implies that even the planning for the learning situation ought to be based on a diagnosis of the needs of a particular set of learners as opposed to a generalized model of "necessary knowledge for all individuals".

Facilities

Such a learning setting normally is reinforced by a different physical ambience than the traditional classroom. The setting for the adult learner is much more that of a conference situation, with movable furniture, maximum opportunity for interaction and a greater reliance on group as opposed to didactic instruction. At the same time, where knowledge transfer is part of the design, the adult learner expects the sophisticated utilization of multi media instruction, to be followed by opportunity for discussion, shared problem solving, and skill development. He also expects time for discussion of knowledge transfer particularized to his background situation. Thus auditoriums, breakout conference rooms and lounges for formative discussion are important.

Style

The adult learner tends to be relatively impatient of educational experiences that involve only didactics and information transfer. While conceptual knowledge is seen as important and he wants to be well briefed on the state of a field or relevant background information, he wants to have the opportunity to take that information and apply it to real time problems and sufficient opportunity for a feedback so he could judge whether or not there has been sufficient skill mastery for him to be able to apply the knowledge to his organizational setting.

The Instructor As A Learning Resource

If the role of the instructor in adult learning is not simply to "profess" didactically, none of the above implies that the instructor's situation is simplified. Quite to the contrary, the instructor becomes very much an educator. A major role of the instructor is not only to direct learners to resources but to help guide them on how to search those resources for applications important to the reader. It is not so much lecturing the readings or summarizing as it is providing a guide to how to approach the material and which materials are particularly helpful for differentiated emphases. A major aspect of instruction, therefore, in the adult learning situation is "orientation" to learning materials.

Nonetheless, it is necessary intermittently for the instructor to assume responsibility for synthesis, clarification and summary. While the adult learner prefers to enter the materials, peruse them, masticate them, and reflect on them he realizes that given the constraints on his time it's important that he have an opportunity to adjudge the extent to which his interpretation and understanding is congruant with or different from the instructor's. He therefore expects and relies on synthesis, summary, and inferences clearly stated by the instructor, not so much as a "statement of truth" but as a benchmark against which he can judge his own interpretations.

Because the adult learner is able to contribute to the instruction it is important that the learner have an opportunity to contract with other learners and with the instructor for sharing in the structuring of learning experiences. An important aspect of the instructor's role is to sequence learning experiences in a fashion that makes "sense" given the differential levels of knowledge and background of the members of the learning situation. Cases, critical incidents, simulations, skill development, along with briefings and knowledge summaries, all have to be intermingled into some kind of a total learning experience. Normally, the instructor dialogues with the learners about the sequencing of materials and shares with them the responsibility for playing roles in the various learning experiences.

A particularly heavy burden on the part of instruction in adult learning is to allow adequate time for assisting in transferring learning to "back home" situations. In addition, the adult learner is concerned that he possesses paradigms and resources for continued self-learning so that he can make use of resources in latter periods without having to be dependent on returning to the educational setting. These resources can include learning teams and resource networks developed through the educational experience, as well as the more traditional sources of information such as the "literature" and key professional meetings.

In summary, while the instructor may not simply be a "professor" he has a heavy burden for structuring the learning experience. This burden includes:

- .clarifying the problem focus of individual learners as well as the learning group
- .providing written media and instructional resources to the group
- .conducting briefings for the learners when they arrive in a learning situation
- .providing for experiential sessions including cases, critical incidents,etc.
- .structuring the sharing of individualized products so that the particularized goals of individual learners are melded into an overview from the entire learning team
- .providing for shared summary statements
- .reinforcement of appropriate skills
- .credentialling of adequate knowledge and skill levels
- .structuring transfer to the back home work situation
- .facilitating further networking following the immediate learning setting

Administrative Characteristics of Adult Learning

All of the above suggest that much of what happens in the adult learning situation has considerable greater flexibility than has been true of the traditional classroom orientation of American Educational settings. Offerings can be made available at flexible times. The actual interactive portions of the learning situation are often of more limited duration and greater intensity and occur in more condensed periods of time due to the time constraints of busy professional personnel. The learning situation can be more problem focused as opposed to subject focused, so that the curriculum can accommodate in flexible modules students who are interested in simply looking at a topic, students who are interested in exploring a number of modules, credential oriented students who want to take a sequence of modules in order to provide for certification, and degree oriented students who want to have an equivalent of a degree granting experience.

It's also true that instruction in the course should relate to the student's world not simply to academic symbols. There's an attempt to relate modules to credentials of professional organizations and not simply to academic credit. Students are allowed to pursue the units in sequences in accord with their own immediate real time concerns as opposed to being locked into the preferred sequencing for intellectual formating of an instructor.

Many of these administrative requirements are violated by the average university and indeed even violated by training organizations. Students are not allowed to enter modules on the basis of immediate problems or needs and then expand their interests to related areas. They are expected to enter at the instructor's preferred point and to follow his particular intellectual sequence. Individualization of the curriculum around focal organizational needs is often rhetoric as opposed to reality. Along with these substantive issues, minor irritants abound. Prerequisites, time of class offerings, to say nothing of parking spaces and registration barriers make it difficult for the adult learner to find an adult learning context in the American education setting.

An Alternative Educational Format Based On Two Overseas Experiences

It is precisely in light of the above concerns that both the School for Business Leadership at the University of South Africa, and the Educational Development Unit at the Western Australian Institute of Technology began to explore alternative programming for professional education. Their clientele group were predominantly professional, technical and managerial personnel located in diverse or relatively small population centers often remote from the urban location of the university itself. The clientele were "busy managers" who felt a serious need for upgrading of professional skills, a need to be briefed on new information in their particular technological area, and the need to upgrade decision making surrounding problems that they and/or their organizations were faced with. Many of them were involved in a second career shift---an engineer who becomes Director of Research, a physician who becomes Chief of Staff, a marketing specialist who becomes the Administrative Vice President. Although the focal point of the efforts at both universities were degree related, it was admitted that many individuals would enter the learning sequence and not complete requirements toward the degree but would take a flexible number of modules depending on their own needs and interests.

Let me sketch the general format for these educational endeavors, ignoring for the moment differences between the two countries and emphasizing designs in common.

The Educational Design: Teams and Classes

Individuals were allowed to register for any particular learning module or course only as a member of a "learning team". Wherever possible, two or three members of the same organization were encouraged to join a "learning team as opposed to allowing isolated individuals from an organization. There organization families reflected strong commitment to the transferability of knowledge and the feeling that one would need both personal and social support in trying to implement new learning in the backhome organization. At the same time, there was a requirement that any team also include members from multiple organizations. In summary, teams consisted of about nine professionals often from two or three companies who were sufficiently geographically proximate so that they could meet intermittently over a program period called a "quarter".

A "class" would consist of forty to sixty individuals divided into about nine learning teams who had agreed to commit themselves to the investigation of a specific set of typical modules over the quarter. The class would be brought to the University for a three day orientation to the learning materials, and for team building exercises. Participants would meet at the University not to be lectured on the readings, cases and films that they would undertake to study individually and in their learning teams, but be provided an orientation to the readings and resource material that they would study as independent adults. The entire set of readings made available to each participant, was reviewed by faculty. Types of questions that one should be asking from the materials would be analyzed. Key issues that exist in the field or differences of opinion were anticipated. The basic concepts and paradigms for problem analysis were protrayed. There was then opportunity for the learners to select an approach to analyzing the materials congruant with the students' own purposes, an opportunity for learning teams to develop their own specialized problem oriented foci and the development of reasonably individualized team assignments negotiated with instructors.

Teams would return to their own geographic area and individuals would begin digging into the resource materials. Once every two weeks teams would gather face to face in groups of nine to review diagnostic questions provided by instructors and to prepare project assignments particular to their own problem foci. These project assignments and discussion questions were mailed to the instructor. The instructor at the home university would then analyze these assignments and projects and arrange a telecommunication conference first with each team, which would often result in some revision of the project assignments, and then later with the class as a whole. Normally the meetings with the class as a whole would be done through educational television networks. While it turned out to be very feasible to talk with a learning team of nine through teleconferencing (particularly since the agenda for the conference was well focused in the team assignments) it was found to be more enriching to have a brief synopsis of each team's project in the form of a briefing together with the instructor's comments done through educational television. These "class" sessions occurred about once every six weeks at natural breaking points in the instructional materials to be covered during the quarter. Teleconferences with teams occurred every three to four months.

Towards the end of the quarter students were able to negotiate through telephone conferences, individual projects separate from team assignments that allowed the student to begin to hone the package of resource materials toward a focus on a problem that was both organizational and personally relevant. While often these projects were individual, on other occasions, the project could be a family group. Whether individual or group projects, all projects were reviewed and discussed at interim developmental phases in some detail by the learning team as a whole. The terminal point of the first quarter's effort were project papers which indicated an area of application to which the learning resources in quarter one would be directed in quarter two.

Once again, at the end of the quarter, all members of the class gathered at the home university for an opportunity to dialogue around the focal projects. Ample time was provided in small groups now made up of heterogeneous teams to review project designs and to set objectives for an applications effort in the second quarter. The purpose of the second quarter's effort was to actually enact the project designed in quarter one under the aegis of two sets of resources. First, one's own learning team and second, interaction with the instructor through teleconferencing. This was an opportunity for both application of concepts learned and for coaching and tutorial experiences in order to achieve skill development. As part of the project, managers from client organizations in which projects were implemented could be brought by the student to his own learning team for a briefing on the objectives of the project, related background information, etc. In this sense learning teams became "consulting resources" to organizations. This way, the team had an opportunity to be a resource to individual project personnel, but also had the additional reinforcement that comes from teaching a body of information, and talking through design applications with real world managers who had not been part of the first quarter's experience. Once again, teleconferencing became an important aspect of these efforts. After the learning team shared their project with outside organization members, and accepted or rejected modifications which might improve the project, there were often remaining questions or concerns prior to the initiation of the project. The role of the backhome university instructor was to serve as a "consultant" to the team and the organizational incumbents answering questions about and reflecting on useful tactics and strategies for the implementation of student projects. Again, telecommunication was utilized. These telephone conferences actually were reported in later evaluations to be one of the most important aspects of learning. Many of the principles which had been discussed in more abstract fashion in quarter one became much more real and viable as the students explored with instructors refinements of application which enacted concepts as specific projects in quarter two.

Once again students gathered at the end of the second quarter at the home university to share the results of their intervention projects, to indicate successes and failures, to debrief the experience in terms of lessons that could be gleaned from the particular to the more general, and to begin to explore objectives for the third quarter's effort.

The intent of the third quarter was to broaden the range and repertoire of student skills beyond the experiences surrounding a single project to more generalizable issues and applications. Relying on the organizational experiences in the second quarter's endeavor each team was responsible for constructing critical incidents, cases, and simulations (not necessarily replicating all the realities of a backhome organization project). Taking together, these cases provided for diverse set of experiences against which the knowledge base in quarter one was relevant. These cases, etc. were presented in writing to the instructor who chose a subset as assignments for all regional teams to utilize as applications learning materials and simulations. Each regional team had an opportunity to analyze several cases and send in their summary analysis and comments to the home instructor. The home instructor once again teleconferenced with each team concerning the strengths and weaknesses of their particular approaches, but also included in the teleconference the authors of the case.

Once again at the end of the quarter, all groups came together with each regional group assigned to a particular content area to do three things: First, to summarize the major conceptual elements that seem to be significant in dealing with their particular focal area of expertise. Second, to indicate the types of organizational barriers and difficulties encountered when trying to cope with this area in real time and real world situations (as well as in cases), and to indicate the types of intervention mechanisms that might be helpful. Third, to provide a critical analysis of additional resource material and to suggest a network of contact people that would be helpful to individuals who might be encountering these issues at some future time in their organizations.

At the end of this last gathering, students left with a feeling that they had been exposed to a useful final summary of concepts, helpful exemplifications and applications, and knowledge of individuals and resources available to them at some future time in which a particular problem area might become a focal concern in their organization. They now felt that they had a network of contacts that they too could reach by telephone

Summary

The entire formating of this educational experience differs tremendously from the classical classroom model generally available in the United States. It also differs substantially from the two/five day conference programs that constitute another substantial portion of adult education endeavors in the United States. There are a number of aspects of the model I think are worthy of note.

First, the model places heavy responsibility on all the participants to be active resources to each other in the learning experience. The role of the "instructor" is largely interactive and reactive as opposed to being solely proactive. Other than the orientation to the learning materials and key summaries, the instructor provides his "professorial insignts" largely in the context that are problem real to participants in the educational situation.

The educational format depends heavily on learning teams of from six to twelve students which include multiple individuals from the same organization as well as a multi organizational composition. This allows for some support within one's home organization when trying to transfer the learning, but assures that one doesn't get locked into the specifities of personalities in a single organization in trying to deal with concepts and applications.

The learning situation provides for learning over time. It suffers from neither the necessity of being in an away from home situation for a long period of time, nor artificial collapsing all efforts into a three or four or five day period. Interaction is maintained between the instructor and learners through focused telephone conferences. Team products reviewed in writing by the instructor provide a clear and crisp agenda against which teams can interact with the instructor by telephone. The experience is that 9-12 people can meet quite efficiently by telephone as a result of the structured team assignments.

There are four large group meetings of the "class" in which learning from individual teams are shared across the entire constituency of learners. However, since these class events are built on products presented in writing and available for reaction and editing by the instructor prior to the "class" meeting, the class get togethers are well-structured, intense, and involve participation by all members.

The entire format of this approach to education across geographically disbursed areas would be impossible in the absence of telecommunication. Instructors at these universities are able to coordinate two and three classes in any quarter, and despite vast geographic distances have a sense of being in intimate contact with their class teams. Intermittent meetings on campus allow for the face to face reinforcement and conviviality that are important preludes to telecommunications. As a result of spending a week on campus, subsequent teleconferencing is seen as "personal" and warm, not sterile and remote communication.

Finally, the entire sequence of events is particularly compatible with the model of adult education presented earlier. Many of the features of adult learning are accentuated by the sequencing of individual, learning team, teleconferencing with instructors, and class meetings. Artificial condensation into short course formats are avoided, and time for application, experience and skill development to meld with concept review are provided for.

AN ANALYSIS OF AN EXPERIMENTAL UNIVERSITY COURSE VIA SATELLITE: IMPLICATIONS FOR INTERACTIVE TEACHING-LEARNING SYSTEMS

Yvonne M. Martin[1] Ph.D.
Assistant Professor
University of Victoria
B.C. Canada

A substantial number of observation systems have been developed in recent times to study the dynamics of teacher-pupil interaction in conventional face-to-face learning situations. Perhaps the best known and most widely used of these systems, Flanders System of Interaction Analysis, focusses on the quality of the verbal interaction between teacher and pupil. Over time a number of empirical studies using this technique has yielded fruitful information. For instance, there are indications that teacher interaction patterns which tend to maximize a student's freedom to participate in a learning experience are more effective in bringing about learning (the priority in all teaching-learning systems) than interaction patterns characterised by a tendency toward the minimization of the pupil's freedom to participate in the learning experience. (Amidon and Flanders)[2]

A major source of difference between conventional study and distance study with its non-contiguous, and hence non-conventional learning situations, is that the interactive phases of distance study are conducted by print, mechanical, or electronic devices, while interaction in conventional study is face-to-face. That is, the media of communication via which teachers and students interact are different. Holmberg's development of a theory of distance study as one of "guided didactic conversations" appears to underscore the importance of the quality of the "conversation", or the interaction, carried on within the student and between the student and the teacher. (Recall the focus on pupil-teacher interaction in conventional learning situations referred to earlier). In a similar vein, Egan[3] in his presentation of Structural Communication as an alternative to linear and branched programming, notes that a truly educative programmed method should embody elements of really good teacher-student dialogue.

It may be worthwhile at this point to summarize the points, expressed and explicit, thus far. Distance and conventional teaching-learning systems appear to share a certain commonality. Priority in both instances is on learning, and the quality of the interaction, dialogue, or conversation between teacher and student is deemed of paramount importance in effecting that learning. A major source of dissimilarity in the two systems is the medium of communication via which the dialogue or interaction takes place. One is face-to-face; the other is via mechanical, printed or electronic devices. Systems have been developed to describe and analyse the dynamics of the interaction between teacher and pupil in conventional learning situations. For instance we know from the Flander's observation system[2] that teachers, in general, talk for approximately 66% of the time and, from McNair and Joyce [4] that there is a verbal communication between teacher and pupil about every 8 seconds.

Some of these observation systems developed for the study of conventional teaching-learning systems may be appropriate for the study of some aspects of distance study. This, however, has yet to be established. Furthermore, it seems reasonable to argue that the effects of the use of electronic and mechanical media would be substantial enough to affect the dynamics of interaction, and perhaps, call for the development of new frameworks of analysis. It appears, too, that to date, there has been little study in the dynamics of teacher-student interaction in distance study. Specifically, there does not appear to be quantitative or qualitative descriptions of the dynamics emerging when interaction is via mechanical and electronic devices. Moreover, there needs to be an examination of the implications of these emergent patterns of interaction for learning, in the light of relevant literature.

A team from the University of Victoria in British Columbia, Canada, recently presented the first Canadian University course offered for credit via Anik B, an interactive communication satellite. Communication was two-way audio and one-way video. This provided an opportunity for examining a number of issues, some of which related to the impact of an electronic and mechanical communication system on the dynamics between instructor and student.

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The Experiment [5]

Anik B, a communications satellite owned and operated by the Canadian Federal Government, is currently being employed in experiments in two-way communication across Canada. The mandate given to the project team was to present a third year course in Educational Administration successfully exploiting the interactive nature of the system. The sixty-five administrators and potential administrators of schools who registered for the course met for classes in community colleges in 5 of the 6 interactive centres falling within the footprint of the satellite -- Cranbrook, Dawson Creek, Port Alberni, Prince George, and Terrace. Terrace, the furthest, was 848 miles from the transmitting station: at 67 miles away, Port Alberni was the nearest. The number of students in a single centre ranged from 6 to 23, with a mean section size of 13. Eighteen students opted to audit the course; of the remaining 47 who originally intended to take the course for credit, 33 submitted final projects for a course grade. The completion rate was 70.21%.

The students convened once a week for 10 weeks in classrooms of community colleges, in the 5 locations, equipped with T.V. monitors and telephones all connected to the central system. For each session there was a maximum of 75 minutes air time. On the average 60 minutes were used for instructional purposes and the remaining time for tending administrative , course, and system details. Pre-session and post-session activity times combined with actual air time to meet university time requirement for 1.5 units of work.

The project was carried out under the auspices of University Extension and the office of Education Extension Programmes in the Faculty of Education. A project director, a professor of Educational Administration was responsible for the development of the curriculum, the instruction, and the project as a whole. An academic assistant, a graduate student in Educational Administration, shared these responsibilities. A project coordinator was responsible for personnel, preparation and delivery of course materials, and the delivery of the course content via the interactive satellite system. These responsibilities were shared by another graduate student in Educational Administration.

The philosophy, general direction of the course, and its outline were developed by the project director. The instruction was presented by a team of 9 instructors, including the director. Two instructors conducted two sessions, 2 shared a single session, and the remaining 6 conducted one session each. The director conducted the first and last sessions, and introduced and concluded all other sessions in an attempt to provide links between the sessions. Instructors were invited to participate based on their expertise recognized in the general content area and specifically in the topics that formed the sequence of the course outline. All instructors were invited to a session where the general direction of the course was discussed so as to give them a sense of the whole. There was a large degree of complementarity among the topics.

A resident field associate, a principal, carried out some administrative activities in the field (for instance, overseeing registration of students, administration of a pre- and post-test questionnaire, etc.) and facilitated the group in pre- and post-session activities as well as off-air assignments. These associates were oriented to their function and responsibilities via the system before the course began.

In summary, the team which delivered the course was resonsible primarily for course structure and content, organization and administration of the delivery, course creation, evaluation and revision, all as defined by Holmberg.[6] Other facets as the establishment of a rationale for distance study, overall goals and objectives, identification of target groups and organization and administration at the institutional level emanated from the offices of University and Education Extension. The medium of communication used and broadcasting facilities which existed beyond the physical limits of the University were given conditions.

It appears possible to construct a typology of teaching-learning situations according to the degree of physical separateness existing in each case. Such situations may range on a continuum from face-to-face, at the upper end (where feedback is constant, instantaneous, and both verbal and non-verbal) through distance study situations where this type of feedback is reduced quantitatively and qualitatively by the substitution of electronic, mechanical and print devices, in conducting the pre-active and interactive phases) to the lower end of the continuum where there is the greatest degree of physical separateness and feedback is considerably slower.

Although the present course under analysis falls technically in the category of distance study it must be noted that the communication medium of interactive satellite created the potential for a teaching-learning situation which approached the face-to-face situation in its interactive phases very closely. Such combinations of methods may be fruitful. Razik[7] reported that instructor-taught programmed groups were superior to those who took the programmed instruction, without an instructor, and a control group. Holmberg [6] notes however, that while combinations of distance and oral methods may be advantageous, major pitfalls include over-control by efficient instructors, too much instruction, and more or less conventional classroom teaching. It appears that the situations at the extreme end of the continuum have been described and analyzed to some degree, but new teaching-learning situations created by improved technology, as in the present case, have not been analyzed in terms of teacher-student dynamics.

A number of issues related to the use of the medium in the educational setting appeared to emerge during the delivery of the course. One such issue related to the impact of the medium of communication on the dynamics of teaching and learning. The literature on socio-technical systems suggests that there is a relationship between technology, environment, sentiments (and therefore behaviour), and organizational structure (Woodward;[8] Trist;[9] Miller and Rice.[10] More recently, Powell [11] indicated from a study of variable teaching behaviour that observed teacher behaviour may vary in different instructional contexts. Another, yet related issue concerned the extent to which instructors were able to exploit the interactive nature of the system by eliciting higher order intellectual activity on the part of students.

In the current paper, some aspects of these issues will be explored. This is seen as work towards the development of a paradigm for viewing the ways in which the interaction between teachers and students are mediated by electronic and mechanical communications; specifically, by interactive satellite communication media. A phenomenalistic description will be made of the first and last sessions which were presented by a single instructor, and through the "stimulated recall technique" attempts will be made to establish the relationship between visible teaching acts and the inner thought processes from which these acts emanated (Joyce)[12]. In particular, there will be a focus on inner thoughts that related to the medium of communication being used and the extent to which these thoughts conditioned teaching behaviour.

Some Related Literature

A number of researchers (Egan,[3] Searles,[13] Holmberg,[6] Amidon and Flanders,[2]) appear to relate the quality of student learning to the quality of the interaction between student and teacher. In the distance study setting Holmberg developed some prescriptions for enhancing this interaction. These related to the creation of the opportunity for "internalized-conversation" (the student's mind should have time for reflections) and a relationship between course developers and students that is characterized by a colloquial style of presentation and personal atmosphere.

The Bellack System for classroom observation[14] focusses on certain aspects of the dynamics between student and teacher. Through the use of this system Bellack identified a number of "rules of the classroom game". Among these are (1) teachers are responsible for structuring the lesson, soliciting responses, and reacting to students; (2) the student's primary task is to respond to the solicitations. Hoetker[15] and McNair and Joyce [4] reported similar findings. Amidon and Flanders [2] reported that teachers talked for two-thirds of the time in a lesson and were more directive than indirective in their verbal behaviour.

Analysis

The rest of this paper is a post hoc analysis of the first and last sessions of the series. They were taught by a single instructor, the author. The videotapes of these two sessions were reviewed by the author three times each, and typed transcripts were produced. Critical incidents were then identified for analysis. Two criteria were established for determining incidents that were critical: (1) pedagogical moves [16](verbal and non-verbal) made by the instructor which in her mind were conditioned by the system of communication being used, (that is, one-way video, two-way audio communication via satellite) and (2) attempts at the creation and maintenance of a sense of a single class among 65 students in 5 locations so that interaction would flow naturally between classes.

Session Number 1

Incident #1

(The students have just received information about the system from the coordinator and instructions begins)

Move

1 I[17] We have not been able to get any idea of the class in Dawson Creek ahm...hm...the size of the section of the class in Dawson Creek, but the numbers that I have so far tells us that there are about 40

of us, and I expect that there will be another 15 or so in Dawson Creek. So this is a very large class -- perhaps 54. (Instructor smiles, shakes head positively and gestures with hand.)

Here the instructor attempts to overcome separateness between the groups in the different centres by replacing "the class in Dawson Creek" with "the section of the class in Dawson Creek." This is followed later by the use of "us", and finally by "so this is a very large class" --again, an attempt to overcome physical separateness among the groups through the creation of the "illusion" of a single class, and of a sense of belonging to that class. If communication were to extend beyond student-instructor interaction to include pupil-pupil interaction, then the creation of this sense of a single group seemed important. The instructor, at this point, was more aware of the separateness between the different centres than of that existing between student and instructor.

Incident #2

(a)	Move		
	14	I	Are there any questions?
	15	I	Would you indicate please?
	16	I	No questions?
	17	ET	------
	18	I	Prince George! Yes, Pr. George?
	19	^{18}S	Can you hear me?
(b)	52	I	Is that clear?
	53	I	Will someone in Prince George indicate if what I've said is clear?
	54	I	Prince George!
	55	S	There seems to be silence here and I think that indicates understanding, but you'll have to test that over a period of time.
(c)	106	I	O.K. What kinds of observations can we make about these comments? What kinds of vations can we make which tell us about their meaning base?
	107	I	Would someone in Cranbrook like to begin?
	108	I	Have you made any observations from these meanings which you'd like to summarize?
	109	I	Anybody from Prince George? I'm coming back to you Cranbrook (jokes).
(d)	156	I	Is there anyone in the class who can justify supervision?
	157	I	Why should there be supervision?
	158	I	I'll just give 2 minutes for that.
	159	I	Anyone from Prince George?
	160	I	O.K. I see time is running out. Let me try to make a defence for supervision of instruction etc.

The four examples above, (a), (b), (c), and (d) are illustrations of the use of extended questioning during the session. As comment on this phenomenon, the instructor, on reviewing the segments of the tape, recalled two thoughts which are relevant. First, the intrusion of a sense of the costliness of time on television created a sense of urgency and therefore the need to keep conversation going. There was, too, a resultant distortion of the passage of time. Throughout the sessions under analysis, there was an inordinate number of references to "time" by the instructor and students later echoed this too. There appeared to be no time for unstructured periods of time for thinking: television did not seem a medium for that kind of silence. Second, the lack of non-verbal feedback of an affective nature created, at times, anxiety for the teacher, hence the questions seeking a verbalisation of affective states. The instructor's non-verbal behaviour (for example, frequently glancing at a member of the team present in the studio for affect throughout the session especially when a joke was attempted or a point was made strongly) seems corroborative.

Note that in move 18 the instructor's exclamation was an expression of relief that finally there was going to be some kind of feedback. The student who responded in move 19 was articulate, and interacted boldly. The instructor appreciated his willingness to extend the dialogue, his use of humour, and the nature of the involvement that he created as precedence. Throughout the session, as seen in incidents (b), (c), and (d), the instructor tended to call on the Prince George[19] centre for a response when it was not forthcoming from a question addressed to the whole class. A student there had demonstrated that he was articulate and would use the system and thus keep the conversation going (use the air time efficiently) and relieve the anxiety. The teacher in a face-to-face setting may equally solicit a response from a student whom he knows will respond. It is debatable as to whether the motives would be identical. The instructor, in the current situation had less information, particularly about the affective part of the message and, in calling for a response for a student was, in part, seeking affect. The difference seems to lie, therefore, not in the act of isolating a student or a centre for response but in the reasons for isolating that student.

The following incident is a continuation of the dialogue (a) above and exemplifies other kinds of attempts at seeking affect:

Incident 3:

Move

21 S Is the paper that we are going to write the sole means of evaluation or is there going to be some other way as well to zero in on the kind of a system ..Etc.
22 I Yes. Right now it is the sole means of evaluation.
23 S O.K. Thank you.
24 I How do you feel about that?
25 S Uhhm. Given that we have the means for interaction ...
26 I Yes.
27 S ...even though it is limited compared to the kinds of interaction ...
28 I Yeah.
29 S ...that takes place in a regular face-to-face course it seems to me that the component of instruction should be taken into consideration and somehow we should be given the chance to interact, if not with you through this fantastic equipment that we have, perhaps with the associate that's here with us, and could not that person be involved in the process.
30 S Yes.
31 I Yeah. Thanks, Frank, there will be scope for doing that.
32 S Good, I'm pleased to hear that.
33 I I appreciate what you're saying and as time goes by it will become clearer...
34 S By the way, Yvonne. I'm glad you moved into the centre, now we can see your face.
35 I (laughs audibly)
36 S When you were sitting over there we couldn't see you; there wasn't enough light for us to see your face.
37 I Yes, thank you. I don't think the lights here like me very much. They don't seem to show my true beauty (laughs.)
38 I O.K. Are there any other questions?

The student was prepared to accept the teacher's response in move 22 and end the communication. Because the medium of video communication was one-way and the instructor could not tap from non-verbal behaviour information about how the student was feeling when he acquiesed, the instructor's next move (24) was to seek a verbalisation of his feelings. One relevant consequence, as can be seen from the rest of the dialogue, was interaction with a high content of affective verbal behaviour and humour. In retrospect, this had a positive effect in that it helped to set a pattern of very friendly and warm relations and an amiable atmosphere which lasted throughout the whole course.

Incident 4

Move

(a) 44 I All of us has had some experience of supervision. (Instructor writes EXPERIENCE on chalkboard). This experience may either be direct, that is we have been supervisors or have been supervised (instructor continues to make a diagram on board.)
45 I Oh, that's too high (in reference to writing tending off screen)
46 I ...or it may be indirect: somebody has told us a story. Based on these we develop certain MEANINGS and the
47 I meanings may be PERSONAL (writing on board).
48 I I'm going to break this here (referring to a word).
49 I Or may be a GROUP meaning.

(b) 92 S O.K. In Cranbrook we have something like 25 people ...
93 I Yes.
94 S ...and to come up with anything by even 2 or 3 is difficult, 25 it is virtually impossible ...
95 I Yes, of course.
96 S ...but we did decide it would be a process of observation and feedback and evaluation ...
97 I "observation and feedback." (instructor repeats and writes on the board)
98 S Right.
99 I What did you say about evaluation?
100 S ...it has components of evaluation and assistance.
101 I "components of evaluation and assistance." (instructor repeats and writes on board)

In the excerpts above the instructor externalises inner thoughts (moves 45 and 48) and repeats the student's comments (moves 97 and 101) as they are being recorded on the chalkboard. The compelling factors in these instances were, again, the disturbing sound of silence and, subsequently, in these instances, a compulsion to present continuous commentary, not unlike that which is done at times on commercial radio and television. The following excerpt exemplifies that nature of the anxiety created by the silence and its concommitant lack of feedback.

Move		
178	I	Those are some of the differences and similarities I see. Are they clear to you? I'd like to give you two minutes to respond to that: to either support me or question me or do something, but please, please call.

The instructor has just presented a personal view of the conceptual differences and similarities between supervision and evaluation for approximately 3 minutes. During this time there had been no feedback (non-verbal in particular) which would serve her as a regulating factor. There had been no indication of the extent of the fit between the view presented and the students' view of reality. Move 178, therefore, reflects the high level of anxiety that was created.

The fact that video communication was one-way appeared to make it more compelling that the instructor control the processes of the class, perhaps more than she would need to do in face-to-face situations. Table 1 contains a comparison of mean measures of classroom verbal behaviour from two face-to-face settings and in the present sessions under scrutiny. Note that the percentage of teacher talk moves in the current study (65.4 percent of all moves) does not appear to differ significantly from Bellack's and Hoetker's findings. The instructor, however exhibited approximately 5 times as much structuring verbal behaviour than was exhibited in the other settings. While it would be premature to attempt to explain this in any general way from so small a data base, there are indications that this might be a result of the constraints of the medium. For instance, the instructor notes that she gave consistently more specific details and directions (and even then tended to repeat them for sake of clarity) than she is aware of doing in traditional settings. Because eye contact with students was missing it was almost an attempt to make sure that they were there and were hearing or seeing, as was the case.

The structuring verbal behaviour of the students in this study appeared to be significantly greater than those in the earlier studies -- compare 16 percent of all moves with .4 and .3 percent of the earlier studies. Concomitantly, it appears, there was a reversal of the distribution of responding behaviour: the current students exhibited this behaviour approximately 5 times less than did students in the other settings. More study needs to be done of this phenomenon but the instructor has an impressionistic sense that here, it was more a function of the level of students and subject matter than of the medium of communication.

There appeared to be, too, other areas in which the instructor had the potential for greater control of the process. It was easier in this setting to ignore with impunity and less tinge of conscience a lit button than the raised hand and human face of a conventional setting. The following is an example of that kind of control:

Move		
119	I	Prince George? Would you like to make an observation on the nature of those comments. (A reaction to lit button)
120	ET	------
121	ET	------
122	S	Yes, (laughs). You have more than one, you have two of us on here. This is Doug.
123	I	Oh!
124	I	Go ahead Doug.
125	S	One of the things we might observe is that people don't seem to recognise that adequate or excellent instruction depends to some extent on being able to have people ch ck to see how other people are doing ... etc.

After the instructor interacted with Doug for a while she did not go on to invite the other student to speak, nor did he interrupt and indicate later than he wanted to react.

Session Number 10

Throughout the sessions students in a single centre did not communicate with each other via the system nor did they attempt to communicate directly with students in the other centres. (A videotape of a classroom during one of the sessions and feedback from a field associate, however, indicated that students in a centre interacted face-to-face about the content of the lesson while an instructor was conducting the session via the system.) Furthermore, all communication, even if it were about another student's input, was addressed

TABLE 1

Comparisons Between Selected Mean Measures of Face-to-Face Classroom Verbal Behaviour in Bellack (1966) and Hoetker (1967) and Current Study.

Measure	Bellack	Hoetker	Present Study		
				Session[1] 1	Session[2] 10
A. Percentage of teacher talk, moves	61.7	65.7	65.4	72.1	58.6
B. Distribution of teacher moves, as percentage of all moves					
STRUCTURING	4.8	3.6	26.7	35.6	17.7
SOLICITING	28.8	32.3	16.6	16.9	16.2
RESPONDING	3.5	1.8	3.4	5.0	1.8
REACTING	24.3	27.0	18.7	14.6	22.8
C. Distribution of pupil moves, as percentage of all moves.					
STRUCTURING	0.4	0.3	16.0	11.0	21.0
SOLICITING	4.4	2.0	2.8	3.2	2.4
RESPONDING	25.0	30.4	6.1	5.5	6.6
REACTING	5.7	1.1	2.8	4.1	1.5

[1] Frequency = 219 in 55 minutes; i.e. 1 communication every 15 seconds

[2] Frequency = 333 in 60 minutes; i.e. 1 communication every 11 seconds

Compare with data from face-to-face settings -- 1 communication every 8 seconds (Joyce, 1979)

to the instructor. This lack of direct interaction via the system among the students in different centres was incongruous with the instructor's notion of a single class in interaction. In the final session, therefore, the instructor attempted to contrive circumstances which might encourage this kind of interaction. All the students were given an off air assignment in which they were required, as a group, to make conclusions about certain elements of a case that had been presented. Before they began the assignment they were told that Terrace, for example, would be asked to report on the conclusions reached there and Cranbrook should then be prepared to react to Terrace's conclusions by speaking directly to Terrace rather than indirectly through the instructor. This was done three times so that each group had a chance to present its conclusions and to react to a presentation. The following occurred after the first presentation:

Move		
91/2/ /3	I	Okay, now Cranbrook you've heard Terrace's summary would you talk to Terrace about that. Tell them how you feel about it. Tell them whether you agree or not. Question them.
		(Silence)
94	I	Arlene does Cranbrook have a coffee break? (jokes) Cranbrook are you there?
		(Silence)
95	ET	------
96	S	Yes this is Cranbrook.
97	I	Oh, good.
98	S	We do agree with the problem as Terrace has suggested it and we think that maybe it was in the pre-conference where the method of collection should have been supervisee initiated rather than supervisor initiated. Etc..
99/ 100/01	I	Oh, Okay! That's good, but you know, I want you to talk to Terrace about that. Etc..
102	S	Hi Terrace!
103	I	Good show!
104	S	I think that we are in agreement with you that there is a lack of understanding by Mrs. Maxwell.
105	I	Mrs. Maxwell
106	S	She doesn't understand the nature and the function of supervision and we aren't sure why she doesn't understand. Etc.
107	I	Would any other centre like to take a minute and address Terrace or Cranbrook on this?

Move		
108	ET	------
109/10	I	Yes, Prince George go ahead.
111	S	Hi Yvonne, its Frank here. I uhhm, just had an idea and I thought ...it was keyed by what someone just said. Etc.
112	I	So who .....?
113	ET	------
114	S	She is after all president of the Primary Teachers Association so she must have some kind of strength in her personality and maybe that's part of what the problem is.
115	I	Terrace
116	S	There was nothing said to either prove or disprove the first theory. Etc.
117	I	Okay, I'm going to ask Dave to come in on that, Dave.
	I^2	Yes, I would agree in some way that there is some fear here on the part of Mrs. Maxwell and how that affects her relationship in the pre-conference will determine what happens in terms of how this problem came about.

Note the periods of silence (moves 93-95) before Cranbrook attempted to react, and then, instead of talking directly to Terrace as first to second person Cranbrook spoke of Terrace as third person. When the instructor in move 101 attempted to correct that the student (move 102) joked, "Hi Terrace!", as if to break the ice. Even after this student-student interaction did not flow naturally. One deterrent that is evident was the instructor's subconscious urge to control the process (moves 107 and 116). Although this first attempt failed the spirit of the intent appeared to have been caught by a student who later quipped: (moves 140-143).

Move		
140	S	I'd like to acknowledge Prince George's thought there. They are improving we are very pleased to see that.
141	I	Laugh
142/43	I	Oh, please don't get carried away Terrace. (jokes). Okay so then if I summarize what we are saying. The principal is having a problem...etc...

In the second trial the student used the second rather than the third person. However, when the student asked a question the instructor replied automatically instead of waiting for the centre addressed to reply. Furthermore, since the student could not see the other student he was addressing but could see the instructor and read her non-verbal cues, the responsibility for a response seemed to rest with the instructor. She was much more a part of the interaction than was intended. The results were not otherwise dissimilar from the first trial. The third appeared to be the most successful, although the student-student interaction was not centred on course content as the following reveals:

Move		
285/6	I	Okay, thank you very much. Now Prince George will you just take 2 minutes or a minute and a half if possible.
287	S^1	I can do it in 2 minutes.
288	S^1	Am I coming thro loud and clear?
289	I	Okay, loud and clear, but address your comments to Cranbrook please.
290	S^1	Okay, addressing my comments hmm. I think ...will agree with supervision of the teacher in private...immediate con...
291	S^2	Oh, sorry I can't hear you over the T.V. will you speak up a bit?
292	S^1	Is that clear enough?
293	S^1	Is that any clearer?
294	S^2	Yes
295	S^1	Okay I'll speak a little louder.
296	S^1	Just to repeat again very quickly. Etc.
297	I	Uhmmm
298	S	Mrs. Maxwell would supervise the principal.
299	I	That's another good point. Yes!
	S	... in the process. But the constant problem that appears to me here is this one of Supervision versus Evaluation. Etc.

On substantive issues the instructor tended to attempt to control the process. It will take further study to determine the extent to which this was a personal idiosyncracy or limitation, or was related to the medium of communication being used.

SUMMARY AND CONCLUSIONS

The limitations of the experiences described above as a base for generalisation about teaching by interactive satellite are patently clear. More realistically, the above has been presented as a partial exploration of an experience out of which may emerge issues and questions that may be relevant to researchers and practioners in the field. Four major points of interst, in this regard, appear to deserve reiteration in summary.

The first relates to the quality of interpersonal communication (perhaps the phenomenon most often implicated in this analysis) as it was determined by the medium of communication. The system allowed us to approach the face-to-face setting most closely, but the technology appeared unable to permit that factor needed to make interpersonal communication complete. This produced a kind of fickle reality which created dissonance for the instructor and, by extension, the students. Watzlawich, Beavin and Jackson [20] consider interaction an open system with circular feedback loops. Feedback is both verbal and non-verbal, but it is non-verbal behaviour that transmits messages about the relationship between communicants. This one-way video system did not permit feedback to the instructor of the students' definition of their relationship with the instructor: therefore, the system of communication was only partially open. This did not allow, then, for her regulation of that relationship. Hence the level of anxiety and the high content of affective verbal behaviour exemplified in Session 1.

The instructor brought to the experience cultural traditions and values from two settings; classroom teaching, and television viewing. It seems reasonable to suggest that the case would have been similar for students. A field associate, for instance, remarked that one student could not understand why she was not constrained to do pre-readings as she had always done for face-to-face University classes. In this regard, there was something different about taking a class via television. Pre-readings are not normally mandated for television viewing. The effects of these past traditions as a determining factor on the current experience is the second major point of interest.

The costliness of air-time, the need to present materials graphically, running commentary, delivery modes in which concern for effective pedagogy must compete with a concern for that which is visually aesthetic, were all legacies from television experience which appeared to have had an impact. In order to meet certain television productions standards all instructors were asked to present their lesson outlines in television script format with teacher and student activities described in minutest details and to give the time for each activity. This regime tended to discourage the development of the free flow of ideas for students. The instructor's dominant role in the teaching/learning process and verbal behaviour characterized by structuring were those evident from the classroom setting. It is not surprising, then, that there appeared to be no significant difference between the data gathered from face-to-face settings in the public school and those of the current study. Furthermore, there is an impressionistic sense that teacher talk exceeded the 66% of total class time reported by Amidon and Flanders.[2] This appears to run counter to current notions of distance study, which is predicated on a greater degree of student initiation, choice and control especially with adult students, than exists in face-to-face settings. Further research is warranted to test whether these can be achieved via this medium, and if so, to develop strategies through which they may be achieved. Conceptual work on adult learning and the teaching of adults needs to be integrated with such research to provide a framework to inform practice.

The third major point of interest relates to the notion of teacher control. There were evidences of the instructor's domination of the processes of the lessons. Without more extensive research it is still an issue as to the extent to which this domination was conditioned by the medium or by the instructor's style. There are, however, oblique indications that the medium may lend itself to more instructor control than is desireable, when working with adults. A two way audio and one way video communication system with incomplete interaction among the participants (student-student-instructor) places the onus to control on the instructor, the person visible to students who cannot see each other, and thus lessens the students' potential for control. The greater than normal tendency, in all the sessions, towards detailed and explicit instructions and directions, were all apparently related to the fact that the students were not visible to the instructor.

The fourth and final point of interest, only implicitly made in the foregoing analysis, but persuasive throughout, it that it appeared that the technology proposed the conditions for the instruction. The format of presentation , the dynamics of student-instructor interaction, the physical position of the instructor during the session (after session one instructors were encouraged to be seated at the desk for aesthetic reasons and because a major source of contact with students, the panel, was built into the desk), a tendency towards professionally produced graphics which were so impressive that the student became too engrossed to interact verbally while they attempted to record them, are all examples of the effects of the technology on instruction. In addition, the teaching role was extended to include the operator at the controls who made decisions as to what points to emphasise through his manipulation of the cameras, and the field associate. Caution here is that we do not allow the technology to lead us to reconstruct curriculum and tested teaching/learning processes without contemplation, and to the extent where the curriculum becomes secondary or meaningless.

The intent and scope of the paper will not permit us to discuss in detail what we consider some of the more positive aspects of the course. To provide some sense of balance, though, it should be noted briefly that there is data to be reported elsewhere which indicates that the course presented as a Canadian prototype was very well received; student performance on cognitive objectives was excellent and was comparable to face-to-face settings on campus; the presentation at each session appeared superior to on campus courses presented by a single instructor; the situation opened up the classroom in that instructors taught under the scrutiny of a colleague.

It would be precipitous, as mentioned earlier, to attempt to make recommendations other than a call for more research. The student's perspective on the experience needs to be presented as a complementary component. It seems appropriate, however, to suggest, in addition, that because the successful presentation of this course required both teachers and students to exercise great discipline and to expend perhaps greater emotional energy than would be necessary in face-to-face settings, teachers should be trained specifically to work in this kind of setting, and students be briefed thoroughly about the kind of involvement on their part that the medium necessitates. Work is currently continuing on an analysis of the whole series along the lines discussed herein.

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16. A pedagogical move is the basic unit of classroom discourse (Bellack, 1966).
17. I = Instructor; E.T. = Electronic Tone; S = Student.
18. The first student response during a lesson.
19. Attempts were made early in the session to refer to students by name from a class list. These attempts failed; that is, there was either no response or too slow a response. The alternative of calling on a centre rather than on a person was more effective and became the pattern from this session onwards.

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FUTURE TELECONFERENCE MEETINGS: PATTERN AND PREDICTION

Lesley A. Albertson
Senior Psychologist
Research Laboratories, Telecom Australia

Given the proliferation of behavioural studies of teleconferencing that has taken place in the past decade, a disinterested observer might well ask why, in 1980, psychologists should be proposing more studies of this kind. Those of us who have been involved in teleconferencing research, however, hardly need to be reminded of the complexity of researching this subject, and of the difficulty in reaching definitive answers. One of the earliest teleconference researchers, Alex Bavelas, commented:

> Even a partial list of the behavioural variables that could reasonably be expected to affect the process and outcomes of a teleconferencing facility would virtually define the field of social psychology...Obviously, what is required...is the selection of a relatively small number of variables -hopefully those most immediately relevant to the questions that must be answered about teleconferencing (1963:1)

When behavioural research into teleconferencing began in earnest in the early 1970s, most researchers concentrated their efforts on empirical investigations of the effects of channel type (audio, audio-video or face-to-face) upon meeting outcomes and user attitudes. While channel type seems a logical choice for an independent variable, it has emerged from these studies as far less important than was initially expected. Channel type has been reported as having either no effects upon objectively-measured group outcomes (Chapanis, 1973) or quite subtle qualitative effects, depending upon the type of task being carried out (Short, Williams and Christie, 1976). And while statistical differences have been found in user attitudes towards the different media, these differences have been described as "relatively trivial compared with the task variable" (Short et al, 1976: 152). Unfortunately, however, by the time these researchers had arrived at this conclusion, channel type had become an inextricable part of their research edifice: neither the "Type Allocation Model" nor the notion of the "Social Presence" of a medium can survive unless channel type accounts for a substantial part of the variance between teleconferencing media.

Despite its empirical base, then, the prevailing research framework cannot be retained if key variables and assumptions are to be changed. The evidence thus points to the conclusions that if this area of research is to progress, the selection of research variables and a theoretical model should begin anew.

Selecting Variables Relevant to Teleconferencing Research

Selection criteria

In tackling the question of what conditions are necessary if a small group is to perform at maximum capacity, it is important that the results of investigation are not only significantly different, but are also practically useful. In elaborating this basic principle, the following criteria for selecting research variables were developed:

(i)The selected variables should be capable of being reliably controlled by the provider of the facility.

This criterion leads to an emphasis on selecting variables that will lead to the specification of design changes in the facility. While recognizing that some user education will be necessary, complex behavioural changes cannot be controlled reliably by the system provider. Hence, the teleconference facility should be designed as far as possible to fit existing patterns of conference behaviour, rather than that the user should be required to adapt to the system.

(ii)Variables selected should be capable of

300

testing the upper limits of the facility.

It can be shown, for example, that for a group to perform extremely simple tasks, only minimal facilities are required: written messages handed to the chairman of a conference produces a solution as efficiently as a "real time", fully interactive communication medium. This information, however, is hardly useful for designing a teleconferencing facility. It is not practical to design a range of teleconferencing media and to expect users to match their meetings with the medium that minimally meets their needs. In designing a general-purpose facility, some features may well be redundant; but it is important to know at what point the facility is no longer adequate to the task, and for what reasons distortion or breakdown occurs - even if, in practice, these limits are rarely tested.

(iii)The selected variables should account for a substantial proportion of the variance between teleconference meetings.

This criterion suggests that new studies of teleconferencing should be based upon variables that have been shown to be important determinants of group behaviour. In particular, the variables should have sufficient theoretical backing that specific and falsifiable hypotheses can be made at the outset of the research. Valuable discoveries in both the natural and the social sciences have begun with empirical research, and there are no general methodological grounds for rejecting this approach. However, in the assessment of teleconference facilities, empirically-based studies have multiplied without adding greatly to our basic understanding of the psychology of teleconferencing.

With these three criteria in mind, the literature on small group behaviour was searched for a model capable of generating variables suitable for behavioural studies of teleconferencing.

Evaluating theoretical models of small group behaviour

In the study of small group behaviour, the three recognized attempts at theoretical model-building centre around group processes, group structure and leadership(see Lindzey and Aronson, 1969). Initially, neither process nor leadership models appeared capable of satisfying the criteria outlined above.

Process models centre around the concept of distribution: the distribution of information among the members, the distribution of responses required to achieve co-ordination and control of the group, and, in such cases as conflict resolution and mixed-motive games, the distribution of outcomes. While such models offer an understanding of group dynamics, but such an understanding seems mainly useful for a retrospective understanding of why certain outcomes occurred. Since applications of process models to teleconferencing would require changes in user behaviour, it was considered that variables derived from process models would not satisfy the criteria established above .

Leadership models have developed from the conventional wisdom that the personality and style of the leader affect group functioning. Since leadership style is also a user characteristic that can not be controlled reliably by the teleconference provider, variables generated by leadership models also failed to meet the criteria and were excluded.

Structural models consider the small group as a communication network. Laboratory studies which contributed to this model, such as those of Leavitt and Bavelas, analysed the effects of restricting group communication to such configurations as circles, chains and wheels (see Figure 1). A summary of the results of such studies is shown in Table 1 below.

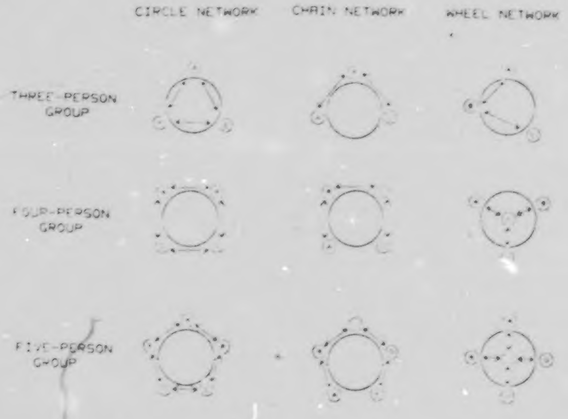

Figure 1: Communication flow in circle, chain and wheel networks

Because group structure is potentially controllable by the teleconference provider, structural models satisfy criterion (i). They also offer the possibility of satisfying criterion (ii). Generally speaking, a centralized network (such as Y, wheel) is the most efficient for simple tasks, whereas a decentralized network (all-channel, or "comcon") is the most efficient for complex tasks. The model thus indicates that for complex tasks, the configuration of the conferring group should not prevent decentralized interactions.

Criterion (iii), however, requires that the variables selected should account for a significant proportion of the variance between conferring groups; and this criterion is more difficult to satisfy. First, in a teleconference, interactions between participants are not physically prevented in the manner of the early laboratory experiments, in which handwritten messages were passed through slots in wooden partitions separating the subjects. More recent work, however, has shown that in groups within which all interactions are possible, group structure still accounts for an appreciable proportion of the variance (see Faucheux and Mackenzie, 1966). Nevertheless, structure is seen as a mediating variable between group task performance and group process, rather than itself determining group outcome. Network structure may assist in the formation of an efficient group organization, or it may hinder it. Furthermore, the most efficient network possible with a given network structure may not emerge in the course of one trial. Few laboratory studies have been able to examine the effect of repeated experience on the efficiency of network organization, but recent studies using computer simulation of network organization suggest that up to 200 trials may be required before the most efficient group organization emerges (Shane, 1979).

Table 1: Performance of circle, chain and wheel communication networks

	Circle	Chain	Wheel
SPEED	slow	fast	fast
ORGANIZATION	no stable form	slowly emerging but stable	almost immediate and stable
EMERGENCE OF LEADERSHIP	none	marked	very pronounced
MORALE	very good	poor	very poor

Other research indicates that the group leader contributes substantially to the emergent network organization. In the network studies conducted in the laboratory, the person occupying the topologically central location is usually appointed by the group as leader, and this appointment is usually also the most effective from the point of view of network organization.

In field conditions, however, the chairman will have been selected in advance, normally on the basis of status within an organization. One of the most influential theories of leadership, Contingency Theory (see Fiedler, 1967) indicates that leaders tend to maintain their leadership styles across a range of situations; and, as noted above, this style is not regarded as amenable to change by the teleconference provider. Nevertheless, what has traditionally been called leadership style can be viewed in behavioural terms that have direct implications for network organization. A democratic (or participative) leader attempts to decentralize interactions within the group, while an authoritarian (autocratic) leader attempts to centralize interactions upon himself. This behaviour can be expressed in network terms as follows:

> ...the effect of a participative leader is effectively to assign an equal weight to all members' resources, whereas the autocratic style is characterized at one extreme as one with a matrix of group members' weights equal to 0 and a leader weight equal to 1. (Shifflet, 1979:75).

The effect of these leader-induced variations in the information flow produced by a network depends upon the type of task being performed by the group. An authoritarian leader induces better group performance for structured tasks, while a democratic leader induces better group performance for unstructured tasks.

It would also be expected that the authoritarian chairman will prefer centralized network configurations, while the democratic chairman will prefer decentralized networks. Further, as shown in Table 1, laboratory studies have also found that network configuration affects group morale: should this aspect then be taken into account in designing a teleconference facility? Fiedler (1967) dismisses member satisfaction as "an interesting by-product"; but while this position may be tenable if a once-only performance is being considered, satisfaction of the members is related to group cohesion, and is therefore important if long-term maintenance of the group and repeated use of the facility are considered. Thus, the theoretical model from which experimental variables are to be derived, although based on a structural theory, has become more comprehensive, incorporating as well some concepts of group process and of leadership behaviour.

Observations of Teleconferencing Behaviour

With this emerging model in mind, observations were carried out of inter-member interactions over three teleconferencing media available in Australia:

(i)Confravision (an audiovisual facility operating between Sydney and Melbourne)

(ii)An experimental microprocessor-controlled group-to-group audio system

(iii)Multi-part telephone calls using a conference bridge

As noted above, with the three teleconferencing media under consideration no exchanges between the conference participants are actually prevented. Observations of teleconference meetings using these media, however, suggest that all inter-member communications are not equi-probable.

With the Australian Confravision facility, for example, videotapes show that a high proportion of the interactions are between-terminal; within-terminal communication is rare, particularly with inexperienced Confravision users. Part of the explanation for this interaction pattern may lie with the physical layout of the terminal (see Photograph 1).

A face-to-face conference configured in this way would almost certainly cause subjective discomfort: the proximity of participants violates the culturally acceptable distances for public utterances. It is difficult for the chairman to keep all participants at his terminal within his field of vision, and his location at one of the two central positions makes it somewhat awkward to address the participants at his own terminal, although it facilitates addressing members at the opposite terminal.

The group-to-group audio teleconference facility (see Photograph 2) constrains communication in a different way. Within-terminal communication is encouraged both by the seating pattern and because there is an asymmetry in the availability of non-verbal cues to remote participants and those within the same terminal. In this type of conference, the leader's task is to make between-terminals interactions as probable as within-terminal interactions.

In the case of multi-part telephone calls, particularly with a large group, the only feasible organization is for the leader to sequentially poll the participants for inputs; any other communication pattern rapidly becomes chaotic. Functionally, then, although all interchanges are possible, the emergent network configuration is equivalent to a wheel network. Interviews conducted by John Short with users of the audio conferencing facility at the University of Quebec supports these observations. In this study, the respondents - mostly chairmen of meetings - felt that the system "subtly increased the power of the chairman and the importance of the chairman" while at the same time leading to a more "democratic" meeting, because the formal meeting procedure ensured that everyone's view was heard (Short, 1973:15-16).

Towards an Interactive Model of Teleconferencing

From the theoretical review and the observations of teleconferencing, the following proposition is put forward:

A teleconference group's capacity to achieve the most efficient organization is a function of the entropy of the medium, the behaviour of the chairman and the complexity of the communication task. "Entropy" here is defined as the medium's emergent tendency towards achieving decentralization [2].

From this general statement, the following specific predictions are made:

1.1 A Confravision meeting will be moderately difficult either to centralize or to decentralize.

1.2 The performance of both simple and complex task will be less effective at a Confravision meeting than at a face-to-face meeting.

1.3 Both autocratic and democratic chairmen will be less satisfied with a Confravision meeting than with a face-to-face meeting.

2.1 A group-to-group audio conference will be moderately difficult either to centralize or to decentralize.

2.2 Performance of both simple and complex tasks will be relatively less effective than in a face-to-face meeting.

2.3 Both autocratic and democratic chairmen will be less satisfied with a group-to-group audio conference than with a face-to-face meeting.

3.1 With a multi-part telephone call, it will be relatively easy to achieve a centralized group organization, and relatively difficult to achieve a decentralized group organization.

3.2 Simple tasks will be performed relatively well, and complex tasks relatively poorly.

3.3 Autocratic chairmen will be relatively satisfied with the facility, and democratic chairmen relatively dissatisfied.

Linking Micro Studies with Macro Studies

The above hypotheses are open to experimental tests that will show what happens within micro-networks under controlled conditions[3]. But given that the telecommunications network provides a substratum upon which innumerable micro-networks can potentially be based, the next problem is to predict the extent to which these potential micro-networks are actualized. Such predictions entail making assumptions that have no necessary relationship to those made in conducting laboratory studies. Macro analysis is an emergent level above micro analysis; each has its own peculiar characteristics.

Many teleconference researchers have employed the concept of travel substitution to bridge these two levels. Short et al (1976), for example, link their laboratory studies to the problem of macro prediction by arguing that if a teleconference facility is shown in behavioural experiments to be as effective as face-to-face communication, and it is cheaper than travel, then the teleconference meeting will substitute for the face-to-face meeting. Consequently, prediction of the future use of teleconferencing has been based upon analyses of the content of present face-to-face meetings, in order to determine what proportion are substitutable [4].

While estimates of demand can be made relatively easily in this way, a number of questionable assumptions are contained in the argument. It is also necessary to assume that the individual who makes the decision not to travel (generally portrayed as a senior executive) is both aware of the results of behavioural experiments and actually makes trade-off decisions in the fashion of the "rational man" of market economics. In the light of recent research into organizational decision-making, this simplifying assumption is difficult to maintain. One management researcher, for example, characterized the decision-making of senior executives in the following terms:

> Senior managers will usually receive for review what amounts to a single option...rather than a set of fully developed choices. They usually face yes or no decisions rather than trade-offs. Rarely, moreover, do the proposals that they see include assessments of possible competitive responses or government constraints that will emerge over the longer term. (Peters, 1979).

It also seems peculiarly inappropriate, when one is dealing with the future of teleconferencing facilities, to consider only the mechanisms of individual choice, rather than the mechanisms of group choice.

Another problem in predicting the future use of teleconferencing is that the introduction of the facility itself is likely to bring about new modes of behaviour. While it can be legitimately argued that people are unlikely to make rapid changes in their behaviour, and that only present behaviour is available for study, the implicitly static view of needs underlying the substitution approach has demonstrable limitations. On the one hand, by failing to recognize that teleconferencing may serve needs that were previously unsatisfied, potential markets may be overlooked. On the other hand, the substitution approach may overestimate demand by assuming that the level of communication represented by present travel is fixed, and must be satisfied by one medium or another. A more systemic view would see present levels of communication and travel as means by which the organization functions within a given context. Levels of communication have not remained constant in the past, and no sound reason has been given for expecting that they will remain constant in the future . Thus, changes in the cost of travel may not mean that communication is automatically transferred to a telecommunications medium; rather, it may mean that the organization changes its mode of functioning - for example, by reducing the geographical range of its operations [5].

If demand is to be estimated from an analysis of existing face-to-face meetings, assumptions similar to those discussed above. are certainly necessary. However, there is increasing evidence that many of these assumptions are untenable. It seems reasonable to argue, then, that a necessary intermediate step to predicting the future demand for teleconferencing is to gain better insights into how demand for teleconferencing is generated. The results of research into social networks at the macro level suggest that network analysis may again be a useful way of gaining these insights.

Macro Studies of Communication Networks

Techniques for analysis of macro networks have in common the concept of an individual as a node connected by lines representing communication links; however, a variety of specific techniques for data collection and representation have been developed. The most appropriate technique in a particular case is likely to depend upon the population and the problem to be solved.

In business and industry, for example, needs for teleconference facilities are likely to be latent rather than manifest. In order to predict the organization's needs for teleconferencing, therefore, it may be necessary to conduct an audit of communication patterns, and, by examining the organization's goals, to recommend ways in which using teleconferencing could improve organizational effectiveness (see Albertson, 1975). Other research evidence suggests the importance of inter-organizational communication in the diffusion of technological innovations (Czepiel, 1975). An adequate network technique in such cases may therefore need to go beyond the single organization as the unit of analysis. One possible means of achieving this would be to explore a hierarchy of networks (see, for example, Conrath, 1973) that includes an inter-organizational level of analysis as well as intra-organizational levels of analysis.

In the area of community service, Kay and Kramer (1978) have shown that a network approach in which the population sample is derived using a "snowballing" technique provides a useful methodology for defining communication needs within a rural community. In urban communities, however, potential teleconference users may initially be quite unconnected [6]. In this context, the concept of "blockmodels", which is based upon similarity of ties (rather than sociometric choices) and which identifies gaps in communication networks, may prove useful (see White, Boorman and Breiger, 1976).

New Directions in Teleconferencing Research

Attempts are currently being made to establish theoretical links between micro and macro social networks (see, for example, Clark, 1979). These developments open up exciting possibilities for developing a comprehensive framework for teleconferencing research. Meanwhile, the network approach promises to provide a workable alternative to the prevailing channel/substitution paradigm in teleconferencing research: a paradigm whose assumptions have become increasingly discredited.

Notes

1. This result in itself has implications for the conduct of teleconferences; few teleconferencing groups would have sufficient experience for the most efficient network organization to emerge.

2. An objective measure of the centrality of the emergent network was provided by Mackenzie's Total Expected Participation Index (TEP). The value of TEP ranges from 0 to 1, being greatest for a decentralized network that permits maximum information flow and least for a completely centralized network. A decentralized network, according to this scheme, is defined as having greater entropy than a centralized network.

3. Pilot tests of these hypotheses have just been completed at the Telecom Australia Research Laboratories, and results are currently being analyzed.

4. Champness (1972) estimated that up to 65% of existing face-to-face meetings could be replaced by teleconferences. Later estimates are more modest, although the basic approach remains unchanged.

5. The "generated" meetings discussed by Short et al (1976) are seen as necessarily increasing the estimates based on substituted traffic.

6. An example is the "Telelink" service operating in two Australian cities. This service uses multi-part telephone conference calls to provide socially isolated and housebound people with an opportunity for group communication (see Albertson and Bearlin,1978).

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HUMANIZATION IN TELECOMMUNICATIONS:
A DIGRESSION

Leslie Blackwell
Associate Professor of Education
Western Washington University
Bellingham, Washington

Introduction

"In teleconferencing we use a term which describes those actions that lead individuals to feel that their uniqueness is being considered. We call it humanizing. Humanizing also involves the creating of an atmosphere in which the distance separating the participants is seemingly overcome because of a one-group rapport"[1]

Teleconferencing (also called telecommunications in this paper) is a means of sending a verbal message via dedicated telephone lines to numerous stations some distance away while providing opportunity for verbal feedback. In essence, an instructor may present a lesson and elicit comments, questions and answers from his students. The uniqueness is that there is no visual contact between instructor and student and between most students. Because of this problem (no visual contact), telecommunications employs the techniques of "humanizing" to more effectively present the message. Such techniques include roll calls, asking specific questions, and presenting problems for different groups. It says to the instructor to be himself. While each medium of communication in teaching, (i.e., lecture, film, laboratory experience, television) mandate certain methodologies for efficiency, little has been written about "humanizing" from an academic point of view.

This writer presented a credit course in education on the new Washington Educational Telecommunications Network (WETNET) initiated by the University of Washington. Humanizing techniques were planned and employed during the weekly class presentations. However, observation by this writer indicated that not all humanizing techniques were effective nor in some circumstances, appreciated or needed. Postlethwait apparently observed this years earlier in his now classic audio-tutorial approach to learning at Purdue when he noted that his students suggested that he leave his humorous anecdotes out of his learning material.[2] They wanted just the necessary learning material.

To this writer and his colleagues, some provocative questions were raised. Under what conditions, i.e., types of students, subject area, methodology, etc., are humanizing techniques mandated? Are there conditions in which such techniques might effectively decrease learning? What makes students listen? How may an instructor present information in such a way as to provide optimum listening (as well as learning) material to the students on distant stations. These questions, in lieu of a hypothesis, needed to be studied. Furthermore, one can then better define "humanizing".

In most learning situations, a learner learns from something; whether it is the restructuring of past information (aha!) or by the intake of data or information into the brain through the five senses via media such as a book, film or a teacher. To restate the obvious--learning is an aggresive act--that is, the brain is active rather than passive; ask any early childhood teacher. Learning is a complex set of behaviors that develops to different levels or degrees in different people. In all probability and in simplified terms, people take in information much like food at a smorgasbord, from total intake with no selectivity to little intake due to great selectivity. This intake of information is regulated by a filter or gate-keeping process somewhere in the brain.

Before proceeding, and to provide for a common starting position, some assumptions should be made: that efficient learning is the focal point of this discussion; that teaching has some effect upon learning, and lastly; that teaching is comprised of an element called communication. In technical terms, in the act of teaching, a teacher selects a message, encodes it in a medium, and transmits it to a student via a delivery system. If the message is received by the student, communication has been accomplished and learning may result.

Recent Theory Regarding the Brain and Learning

In the past few decades, much understanding of the brain has been advanced which has a potential impact upon education and telecommunications. Hart,[3] in a classic paper, recently summarized the findings of brain research. It is entirely appropriate to review his *five* tentative but significant generalizations and discuss how these generalizations on the brain relate to learning via telecommunications.

The first generalization states that the "human brain is intensely aggressive. Each brain is highly individual, unique; it seeks out, demands, and will accept only what it needs next to 'make sense' of surrounding reality, as it perceives that reality".[4] It would appear that humanization techniques assume to some degree that the learner at some distant station is a passive individual in need of some motivation in order to more effectively receive or understand the learning message. If telecommunication's main purpose is to transmit learning messages, then "creating an atmosphere which focuses on the individual" may possibly detract from the learning message. Experience at Western Washington University in presenting credit courses over WETNET tend to support Hart's first generalization in that students appear to be more assertive in their comments to the group and the instructors than one might expect in a traditional classroom. Written comments about the learning situation by students suggest that each receive information to support each one's position. At present, data are too small to be conclusive.

Hart's second generalization is that the brain will accept only the information or input that it wishes to admit. In essence, it is highly "gated", sorting out, if you wish, the wheat from the chaff, only in this case, each unique brain decides what is "wheat" or important, and what is unimportant. The brain accepts information depending upon its past experience and not on what a teacher necessarily says or how it is said. Thus, for telecommunications, rather than "planting" questions as some humanizing techniques suggest, it would be more appropriate to provide time for students' remarks and questions in the presentation. No questions may indicate complete acceptance of the learning message; on the other hand, it may not. This generalization is not at odds with humanization theory, but it may suggest why some students do not respond to some humanization techniques.

The third generalization is that the newest and major portion of the brain, the neocortex, does not function well under pressure or threat as described in the proster theory (named after the concept that the brain is a structuring mechanism, not named after a person). Here, humanizing and recent brain learning apparently are compatible, for as we humanize a learning situation, one may well be removing the threat or pressure which is nonconducive to efficient learning. However, another provocative idea becomes apparent with this generalization--that is students at different stations in telecommunications courses may not feel the pressure of direct eye contact of the instructor. It is possible that some students when under pressure receive help from their peers with no one the wiser at the instructing station. Present data at WWU seems to suggest that two or more students at any station other than the instruction station lowers pressure and increases "enjoyment" of learning. A graduate student aptly stated, "Where else can I sit in jeans with my feet on the table, drink coffee and talk to the professor?"

The next generalization states "young students in particular must talk to learn well and rapidly, for a great portion of the human brain (unlike those of laboratory animals) is devoted to language--particularly the neocortex. In most classes, students are not given speaking opportunities. However, telecommunications courses (at least those at Western Washington University) mandate speaking opportunities. Making sure that everyone can report on a learning task by vocal means may increase learning as well as be a "humanizing" technique.

The last generalization of brain research suggests that the brain does not use "logic" or a step-by-step method in learning, but rather is more like an analog than a digital computer. The "Aha" phenomena may well be the norm rather than the exception. This finding has enormous impact for education and educators. It begins to explain why some students can "skim" a branching textbook and learn, while other students can learn in a non-logical environment. What is the implication of this generalization to telecommunications? It would appear that training instructors need to present more information, possibly by sending advanced handouts that correspond to the presented verbal material. It would also seem to suggest that presenting problems to groups of students at each station in order that they may work together on the task, utilizing all the data and techniques they have been given, would be an efficient method of communicating on telecommunications.

As an aside, Hart's generalizations go a long way to explain what this writer calls "cocktail perception". We have all been to a cocktail party (or similar group situation--wedding reception, political gathering, etc.), where one talks in animated conversation with another person, listens to a conversation behind him, through peripheral vision watches who comes and goes, makes note of the taste of caviar, smells the perfume or cigarette smoke and in essence handles a variety of inputs simultaneously. If the brain can apparently do this with ease, what does the brain do in listening to an instructor on telecommunications, particularly when a student is asked about the weather when he is contemplating the materials about the course?

Recent Experiences in Humanization

Western Washington University has had the good fortune to be a participating member of WETNET, not only in presenting credit courses but also as a receiving station for workshops, planning sessions, developmental programs and seminars. Instructors presenting Western's credit courses are trained in media presentation (i.e., television, radio, etc.), and score in the upper quartile or higher in student response evaluations. Not only were humanizing techniques planned for the presentations, but in the initial course, two instructors taught the material; one presented the lesson while the other offered color commentary. Also, throughout the course, one instructor acted as an ombudsman to solve administration problems.

Student reaction was observed and recorded in several ways--by direct observation at different stations, by student written papers and by direct personal interview. To date there are not enough data to suggest significant findings--WETNET is still in its first year--however, there is some interesting commentary.

Students at one station exhibited interesting behavior. When it was ascertained that the material being presented was of little interest to the group, one individual was given the task of lowering the volume control so the group could discuss more pertinent material. The one person kept one ear for any comments that might pertain to the group. When the instructor moved on to new material, the volume control again was reset to normal setting.

At another station where there were two students, it was observed that in response to questions, a mutual answer was decided upon before responding. They discussed verbally all the material presented, even during the presentation, behavior that would have been frowned upon in a traditional class.

Some negative student behavior was observed due to the presentation of material that was of little interest to the student, but was mandated by the job. Captive audiences, humanizing techniques notwithstanding, are brain antagonistic.

Some Random Thoughts

Not all agree with Hart's generalizations. Wittrock[5] suggests that there are two conceptual models: the analytic and the non-analytic or holistic. The analytical groups stimuli by elements and is able to ignore irrelevant material. On the other hand, the non-analytic model groups stimuli on the basis of commonality and is more observant of surrounding, possibly irrelevant material. It would appear in light of these two models that presentations must be based on analytical and the holistic strategies. The fact that the group stops to discuss aspects of the presentation is a necessary part of the learning.

Some premises, might, at this point, be repeated: 1. that learning to be successful must be active, and 2. verbalization is a necessary part of learning. These premises hold many implications for telecommunication. Luria[6] suggests that language regulates our behavior in three distinct stages: 1. external other, 2. external self, and 3. internal self. For example, a mother might say to her child, "Take the red ball", and the child does. In this case the external words from the mother suggest the action for the child to take. At the next stage, the child might say, "Here is my red ball", as he picks the object up. In the last stage, as the child grows and matures, he internalizes the words into generalizations and codes particular to his background, which formulate his voluntary action. In telecommunications, it is obvious that the initial two stages are employed--that the instructor talks to his students (external other) and they respond to his questions (external self). One wonders if humanization helps with internal self. One of the chief characteristics of humans as a social being is his use of language and tools in adapting to and mastering his environment and in organizing his own behavior. The latter is particularly true of our reaction to a new environment or task (i.e. telecommunication) we tend to revert to that which is known and familiar. In this instance (learning on telecommunication), the learning environment is quite different from that which is normally experienced.

Let us, at this time, return to Wittrock's two conceptual models, the analytical and the non-analytical. There is a strong possibility that during most classroom situations, the analytical model will be more

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evident than the non-analytic model. Perhaps humanizing only appeals to the non-analytic model which would not be evident during many learning activities.

Possibly a definition of "attention" would be useful. Attention, as defined by Mirsky[7], is "...a focusing of consciousness or awareness on some part of the multitude of stimuli from the environment, usually on the basis of learning or training." He further suggests that there is a conscious energy reacting through the senses to certain stimuli selected by the ego. The amount of attention given to a specific stimulus depends upon the ego needs of the individual.

To state the obvious, humans are a social animal. Because of this, one wants to be liked and appreciated. The assumption is that to achieve this, it is more effective to be perceived as warm, human and caring rather than cold, distant and uncaring. It would appear to be naive to suspect that any single technique will work with everyone. It may well not be a question of "...to humanize or not to humanize..." but, rather, what degree of humanization should occur to be effective.

In this case, the fact that there is an intervening medium (telecommunications) between the sender and the receiver may give rise to behavior that the students would normally consider not acceptable in a traditional classroom (anonymity is greater). There is also, however, in both traditional as well as telecommunication courses, the need to verbalize ideas to other people, particularly those with which you have reasonably good rapport. Since the students do not know and cannot see the instructor (the instructor in effect becomes an unknown, possibly unknowable quantity) the students will tend to turn to others who are present (known quantities) before committing themselves to a response. This may account for the pregnant pauses in response to a question by the instructor; at the same time, such possible interaction by a group of students may indicate less need for humanization.

Humanizing Defined...

Can one define "humanizing" or is it like creativity, something we know we like or dislike but cannot describe? Given Hart's generalizations on the brain and learning, one might suggest the following parameters of humanizing:

1. It focuses on the humaness of the interaction as opposed to the mechanical event

2. It emphasizes the qualitative aspects of interpersonal communications

3. It expresses concern with the general welfare of the student, and

4. It is oriented to the individual development of the student in the subject matter.

Torkelson[8] was investigating factors that affect communication in a teaching/learning situation as early as 1958. He now suggests that there are seven factors that influence learning communications. They are:

1. The skill of the teacher in communicating and in setting the learning condition.

2. The characteristics of the learning resource being used.

3. The differences among learners as they affect the appropriateness of the learning resource.

4. The differences among learning objectives as related to the appropriateness of learning resources.

5. Differences among methods in using learning resources as mandated by 2, 3, and 4.

6. The characteristics of the learning space in which learning processes occur.

7. The organization or structuring of the learning condition.

In this case, the environment has a great deal to do with the problem. On one hand, and for all intents and purposes, the instructor is a non-entity. The only contact is by voice through a box! This has to be somewhat disconcerting. On the other hand, the skill of the instructor in using verbal symbols (words), not only in selection but also the delivery, may be a critical factor.

Conclusions

What, then, can we say about the nature of humanization in telecommunications, given what we now know about the brain and how it appears to accept learning messages? It would seem that the learner basically accepts information in order that he may act upon his environment. If this is essentially correct, then some basic generalizations about humanization and its relationship to telecommunications can be made:

1. Students need to talk on telecommunications more than the instructor. Material and problems should be presented so as to provide maximum opportunity for students to

discuss their thinking and ideas.

2. Humanizing techniques need to focus on the learning of the individual student rather than on techniques designed to develop group rapport.

The educational industry has compared one medium to another medium, methodology against methodology, even teacher against machine. Rather than study entire systems or courses, an effort should be made to look at humanization techniques as they affect different individuals in different educational settings, not just in telecommunication.

There are two other areas for future research. The first area suggests that the environment in telecommunications be studied. In this case, the environment may take the form of credit - non-credit courses, as well as length of time of workshops, courses, etc.

The second area for research is the type and background of the students in telecommunications. There may be a tendency to underestimate the capability of some students. The techniques necessary with low motivational or casual students in workshops may not be applicable to highly motivated, verbally skilled graduate students.

Another area of study may be more in the philosophical arena. Humanization occurs in standard interaction in the regular classroom and is taken for granted. No special humanization techniques are used for blind students who have, like telecommunication students, access to audio only. Therefore, do we really need the special emphasis in humanization for telecommunications? Is it possible that humanization in telecommunication primarily makes the instructor feel more comfortable?

As Hart would, in all probability, suggest, much research in the use of humanization in telecommunications is necessary in order that patterns can be seen in a variety of experiments in order that rough and even vague approximations can be made.

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KEEPING INTERACTIVE DISTANCE EDUCATION INTERACTIVE: A CASE STUDY AT THE UNIVERSITY LEVEL

Linda K. De Grand
Education Administrator
Bell Telephone Laboratories, Incorporated
Naperville, Illinois

Introduction

It has often been noted that successful implementation of television in education has little to do with technical capacity, which is generally accepted as considerable. Rather, problems arise from the educational and administrative attitudes and expectations of those involved in utilizing television as a teaching tool.[1]

After more than two years of involvement with a university's interactive ITFS network, at both the transmitting and the receiving ends, I can most certainly concur. The purpose of this paper is to provide a case study of the technical and human engineering aspects of operating such a network and maintaining its interactive elements to all participants' satisfaction.

Background

Interactive Instructional Television (IIT/V) is the ITFS television network operated by the Illinois Institute of Technology since the fall semester of 1976. Its primary mission has been to deliver IIT's regular junior and senior level undergraduate and graduate courses in areas of high technology and business administration to students enrolled for credit at remote sites.

The interactive element of the network, accomplished via regular telephone lines, enables these remote site students to participate in class discussion while the courses are being conducted live on the IIT campus. Paper flow is accomplished through a courier network which picks up materials, such as class handouts, homework assignments, examinations and books, and delivers them to and from the remote sites.

The typical classroom environment for the remote site student is a television, an autodial telephone, and writing space. On the IIT campus there are two types of classrooms: two small studio classrooms designed to accommodate 24 students each; and two large lecture halls, one for 127 students and another for 250. I will take some time to describe this physical set up because it does much to condition the reactions of the various groups involved in the television operations.

The two small classrooms, which were the original, have much more of a broadcast atmosphere than a normal classroom. Each has augmented lighting and is equipped with three cameras: one at the rear of the room to follow the instructor when he works at the board; one in the front corner to focus on the students in the IIT classroom as they make comments or ask questions; and, third, an overhead camera mounted immediately over the instructor's desk. This camera enables the instructor to work at the desk with a pad and pen rather than at the chalkboard. In addition, the overhead camera opens up an extensive range of visual materials for classroom use which would not normally be possible to use or which would have to undergo a time consuming transformation into viewgraphs or slides. This material is shared with on-campus students by classroom monitors. The instructor's desk is also equipped with a monitor so that he is always aware of how his materials are being conveyed and can request any necessary adjustments.

Audio in these studio classrooms is provided by a lavaliere microphone for the instructor and noise-cancelling microphones operated manually by the students as needed. Two small speakers mounted on either side of the chalkboard amplify voices of the remote site students.

Another aid is a series of three status lights indicating "on the air"; "standby", and "phone call". The latter light alerts the instructor that a phone call has come into the console and allows him to call upon the remote site student. It serves as an electronic mode of raising one's hand in class.

The auditoria are equipped on basically the same principles as the studio classrooms but much more simply. One large speaker at the front of the classroom positioned in a corner at ceiling height and directed into the audience to avoid feedback provides audio from the remote sites. Two cameras are positioned from the ceiling towards the rear of each auditorium. They have a 270 degree swivel capability. However, currently no overhead camera exists and only the instructor has a monitor for purposes of overseeing the camera operator. Since the original expectation was that these classrooms would only be used for large lecture sections where there is little or no discussion, no provision was made for audio from the student audience nor was there any augmentation of classroom lighting for broadcast purposes.

Growth Of System

The addition of TV equipment to these two auditoria reflects the success and growth of the system. Utilizing only two of its available four channels in fall 1976, IIT/V began broadcasting 21 courses to 105 students per semester at six industrial sites. Within a year and a half the system was ready to expand to four channels and into the auditoria.

Particularly important in this expansion was the decision to focus the programming only in specific areas: electrical engineering; chemical engineering; computer science; business administration; and mathematics for support courses. A later edition to these areas of concentration has been mechanical engineering. Moreover, the courses offered are almost entirely at the junior, senior, and graduate level.

In focussing its programming, IIT/V has widened its appeal. There has been a threefold growth in the system. It now serves twenty remote sites and an enrollment nearing 400, broadcasting over 50 courses each semester. Besides the anticipated member roster of high technology oriented facilities, both in manufacturing and research and development, one finds Department of Energy supported Argonne National Laboratory; a cooperative arrangement with an outlying liberal arts college; and a management association dedicated to educational endeavors for its membership.

Participating Interest Groups

Needless to say, such growth has not been without its problems or, as the more positive minded would say, its challenges. Without question, the participants in this form of educational delivery have had a common goal: a productive, quality educational experience. However, because of the particular preconceptions about interactive distance education and the perceptions of their own needs and responsibilities, the various interest groups participating in IIT/V have not always been in accord while moving towards that goal. Integrating these groups has been primarily a matter of successful communication management, i.e., keeping the system truly interactive both technically and humanly.

The first step in this process of communication management has been to identify the interest groups and their concerns and then to determine what tools --- administrative, technical, or educational will alleviate these concerns and coalesce the groups into an interacting academic community.

There are four basic interest groups in this situation: the university faculty; students at the remote sites; the technical staff; and the administrative support staffs at both the university and remote sites.

Faculty

A teacher, by definition, is one individual imparting knowledge directly to another. He really requires nothing more than what he carries in his head, perhaps a few books, and a handful of students in order to ply his trade. As a result, the typical academic is, by and large, a conservative about educational innovation --- even in schools of technology. The invasion of broadcast television into the classroom violates what most professors consider to be a very personal teacher/pupil relationship. Consequently, the primary concerns of the faculty at IIT have been twofold: 1) that the quality of education be maintained; and 2), as a corollary, that the broadcast process not interfere in the normal conduct of the classroom nor require radical changes in materials or procedures. Some very specific concerns have emerged as manifestations of these more general cares. These include how to counsel students as one normally does immediately before and after class or during office hours; how to insure that remote site students have the same facilities as on campus students, e.g., computer access, library reference materials; how to conduct examinations to maintain academic integrity; how to maintain the pace of the class while coexisting with broadcast and interactive equipment; how to use slides, films, view-graphs which are adequate visually for on-campus students but deteriorate dramatically in visual quality when broadcast via microwave to a TV monitor; how to insure that exams, homework assignments, and class handouts are at the remote sites in time for class; how to combat feedback, varying telephone line connections, and manual audio level controls, concentrate on the lecture and still hear remote site students with questions; how to use oversized chalk which is difficult to write with, leaves one awash in chalkdust, but is deemed necessary for picture quality.

Besides these concerns, common to all TV classrooms, the two types of classrooms (small studio and large auditorium) require different adaptations. For instance, in the studio classroom the instructor must train his on-campus students to use the available microphones; in the auditoria, which do not have audience mikes, the instructor must remember to repeat the on-campus question for the benefit of the remote sites. In the studio the instructor's monitor is immediately in front of him and he has eye contact with his camera operator; in the auditorium, where the size of the room prevents a "central" location, the instructor must keep looking over his shoulder to watch the monitor, and his camera operator, because of the location of the console, is not in view.

In addition to these concerns about maintaining quality in the classroom, many instructors experience a secondary concern. Not only are they being placed in an environment which they may feel is creating obstacles to effective teaching but also that environment now allows for videotaping of the classroom activity. In the instructor's mind these tapes have the potential of violating classroom privacy and academic freedom and open up the possibility of usurping carefully developed materials normally protected by copyright and subject to royalty if in printed format.

Remote Site Students

Remote site students share faculty concern about quality. For the remote site student this concern translates into the question of accessibility for, in many respects, this is the primary way in which the student himself can control the quality. If the talkback is malfunctioning, if the instructor is not responsive to incoming questions, if the broadcast appears delayed or ends abruptly, if class handouts do not arrive in time for the class session, a remote site student will feel, rightfully, that he is not able to participate in the class in the same way as the on-campus student.

As another quality control element, the remote site student is always very concerned about the integrity of the process, that he is being treated in the same way as the on-campus student. For example, if an exam is to be given, the remote site student wants it to be the same exam, administered in the same fashion as that on campus. If the instructor, in time-honored tradition, runs an exam off on the mimeo five minutes before the class and thereby misses courier delivery, he may assure his remote students that they can take the exam when it arrives. However, students, who are "psyched up" to take the exam at that moment, feel they are losing that impetus to perform at their best on the examination.

Finally, remote site students have very high expectations of technical quality. In particular, tolerance level for poor camera work is very low for it may mean gaps in notes when the camera operator is not keeping pace with the instructor's chalkboard work.

The Middlemen: Technical and Administrative Support Staff

Technical Staff - The technical staff of IIT/V consists of a full-time chief engineer with a first class FCC broadcast license, a half dozen part-time student supervisors with third class licenses, and some 30 part-time student camera operators.

The first and foremost concern of the technical staff is transmitting a quality broadcast signal. This includes insuring that the technical operations and equipment are functioning in accordance with FCC regulations; providing maintenance --- both preventive and emergency --- on-campus and at the remote sites; developing graphics; and training technical personnel.

The question of training is particularly important. Functioning primarily with student help --- which is both a question of economics and of incorporating IIT/V into campus life --- the training problem is formidable. Each term one must recruit a cadre of candidates; train them; build morale and expertise; and retain as many as possible through midterm examinations and into succeeding semesters.

In addition to these responsibilities, which are to be expected of any broadcast operation's technical staff, IIT/V's technical staff also fulfills a public relations function. This function derives more from the realities of the situation rather than from the conception that the technical staff has of itself. Because the instructor is also, in a sense, the director of this live broadcast the technical staff must respond to his needs. However, the instructor's professional expertise is not in the area of broadcast. Consequently, a conflict of expectations between the technical staff and the instructor can develop. An instructor may have paced in front of chalkboards all of his teaching career, without regard for a camera's mobility; used the same tattered viewgraphs without regard for broadcast quality; or be unused to a microphone dangling around his neck and thereby disregarding the audio effects when it bangs into a desk. The technical staff is first on the line so it has the delicate task in this environment of directing the director.

In addition, the master control room has a "telephone hot line" which is available to all students at remote sites to be used when they are experiencing difficulty. All too frequently this difficulty is not of a technical nature and requires more customer relations service than is generally required of a technical staff. This is particularly true for evening courses when the administrative staff has gone home for the day.

Administrative Support Staff: At the Remote Site - The IIT/V administrative support at the remote site encompasses three functions. The first level is the courier liaison, i.e., the point of contact for paperflow to and from the campus. This may be a receptionist or a training department secretary. Typically, the fewer hands the paper moves through before reaching the next level of responsibility, the registration liaison, the less likelihood of confusion. Many times courier and registration liaison functions are performed by the same individual. In addition to coordinating paper flow the registration liaison will also assist remote site students with registration matters at the beginning of a term, have university information available, make proctoring arrangements, and, in general, handle the day-to-day operations and contact with the university. The final level of administrative support at the remote site is provided by the corporate representative. That individual typically participates in determination of policy and is the site's representative at bi-monthly Users Meetings, or, as it has been called, IIT/V's PTA.

The concerns of this group are, obviously, that the system functions well technically and provides the educational benefits to its employees which were anticipated when the system was installed. The other concern is that it not demand an exorbitant amount of time as all of the individuals have a large number of in-house responsibilities of which IIT/V is only a part. One noteworthy characteristic of remote site participants is that industry experience has caused most to forget the idiosyncracies of academic institutions, e.g., the distinctions between admission and registration procedures, lean support staffing and equipment, and faculty eccentricities.

Administrative Support Staff: At the University - Administrative concerns at the university are also twofold. In the upper echelons there is again the overall concern with quality, which can be translated into a practical concern for maintaining accreditation guidelines. Availability of facilities (e.g., library resources and computer time), provision of student advising, administration of examinations, and adequacy of remote site classrooms and equipment, become the specific manifestations of these concerns.

The first line university administrative support for the network is obviously the IIT/V office. It is, perforce, the glue which must hold all of these disparate elements together, identify problems and set in motion the necessary steps to correct them. In other words, insure the interactive quality of the network, both technically and humanly.

Tactics/Solutions

"Solution" is probably too absolute a term to define some of those techniques which IIT/V has found to work. Developing and maintaining "interaction" is an on-going effort. Nonetheless, certain measures have been successful in meeting the concerns of the various interest groups which have been described above.

Accessibility

1. Talkback - Obviously the lynchpin of interactive television is the mode of talkback. IIT has made some changes along the way, but basically it is the telephone line that has been used in contrast to some systems which utilize FM radio or microwave links. When the system first came into operation dedicated lines were used. The advantages were a clean line, free of noise, instant access 24 hours per day. The disadvantage was cost, a factor which became more and more apparent as the system expanded, both in number of channels and number of remote sites. A survey of the site utilization, showing an average 20-30 minutes open line use per week, per site made the 24 hour availability not cost efficient.

The leased lines were abandoned in favor of a normal business telephone line with an unlisted number for each classroom. Autodial telephone equipment, which had the number for each classroom encoded into its memory, was placed in each remote site classroom. Autodial equipment minimizes the delay of dialing the classroom number and protects the unlisted character of the number. An automatic cut off at the console is also insurance against nuisance phone calls coming into the classroom. Fortunately, it is a safeguard which has not been necessary to date.

To activate the line a student lifts the receiver, dials the channel number of his course, and within approximately nine seconds the "phone call" status light in the classroom on campus flashes, indicating a question or comment at the remote site. It is the equivalent of raising one's hand. Recently, the system was expanded to four telephone ports in each classroom. If the first line is busy, the system automatically hunts to the next number and a free line. Initially it was possible to keep open all four lines throughout a class if students so desired because normally only four or fewer sites would be participating in any one class. Now growth of the system has precluded that solution. A switchboard design, however, is being contemplated which will allow classes with more than four participating sites to be allocated excess lines from classes with a smaller number of participating sites.

Remaining problems with the current system design are: first, manual rather than automatic setting of audio levels (each connection is of varying quality); and, secondly, the psychological barrier which the remote site student must overcome in using the telephone as a microphone only. Instead of receiving his audio response through the telephone it comes from the television. Some feedback can result as the student moves his phone too close to the television. Thirdly, the nine second delay can seem an eternity in a fast-paced discussion. Nonetheless, these disadvantages are minimal in comparison to a system which would cost substantially more.

2. Orientations - Orientations for all participants have also been successful in opening lines of communication.

All faculty members new to the system are invited for an orientation in which they are acquainted with the classroom in which they will be teaching. Failing this, faculty receive a list of dos and dont's, stressing becoming acquainted with the camera operator and calling the IIT/V office when problems arise.

Remote site students are sent orientation sheets and material is also being developed for on-campus students in order to develop their cooperation in using microphones, etc.

3. Evaluation System - Besides the traditional end-of-the semester course evaluations, the network has devised a very simple evaluation form to be completed by remote students during the first two weeks of the term. The form deals only with technical and operational aspects of the system. For a given course, at a given site the questions are: 1. Have you experienced any difficulty with courier service? 2. Does the camera work satisfy your needs for following the lecture, copying material for your own notes, etc.? 3. Is the quality of audio and video satisfactory? 4. How has the talkback functioned? Do you feel you can effectively participate in classroom discussion using it? 5. Do you have any suggestions for improvement?

This form has been invaluable in identifying and solving small problems before they can become major difficulties. For example, a camera operator needing additional training can be immediately identified as can a site with faulty equipment. The responsiveness with which the network reacts makes remote site students feel less remote.

It is also important to note that this evaluation is totally non-threatening to the instructor. This has been very beneficial in surmounting communication barriers with the instructor.

Another variation of the evaluation form is the complaint form beside each phone in the network, particularly the "hot line" in master control. All phone calls are monitored for site, complaint, name, course, and person receiving the call. These are circulated to the director, manager, and chief engineer. Besides the obvious benefit of identifying problems it also serves as a safety valve for student supervisors to make known problems they are experiencing with either remote site students or instructors. The administrative staff can then follow through and alleviate the immediate pressure on the student supervisor to solve a problem. It enables the technical staff to function more closely in what they consider to be their sole role --- maintenance of broadcast quality.

4. Courier Service - Courier service is one of the most important elements in maintaining the interaction of the system. It is also one of the least cost-effective, and least sophisticated elements of the system as it currently exists. The courier service depends upon student class schedules, unreliable student cars, and Chicago weather. In spite of these obstacles it has still outperformed the U. S. postal service and private carriers, as experiments have shown. A clear technical solution is digital electronic facsimile equipment, with which experiments have also been run. However, currently lack of standardization of equipment makes cost again prohibitive. Eventually, however, it may well be the solution whereby a headquarter machine with broadcast capability can be programmed in the evening hours to send and receive materials from the various sites.

Broadcast Quality Transmission

Installing and maintaining equipment which will meet FCC standards is obviously a foremost requirement. After that, however, one immediately enters the area of audio-visual teaching tools designed for television transmission. For example, after many experiments with different types and colors of chalk and writing surfaces we have recently come upon a low cost, low glare white vinyl material which can be put upon existing chalkboards like wallpaper. An erasable felt marker is used on it. Boards are segmented with contrasting tape to indicate to an instructor the limits of a camera's zoom capability. More instructors are taking advantage of the network's offer of graphics assistance to transform viewgraphs into those fitting the required 3 high x 4 wide video aspect ratio; films are transferred to videotape for broadcast as the film is run in the classroom, thereby improving synchronization.

Most importantly for video, from the technical standpoint, has been the initiation of a training program for all camera operators. A student supervisor, whose responsibility is strictly training, selects new camera operators and works with them until they reach the desired level of proficiency. Besides supervision while broadcasting, training sessions are set up in which a professional tape on camera techniques is run. More importantly, tapes made of each camera operator's actual work are played back and discussion opens up about problems and solutions. Because of the peer character of these groups, they have had a high level of success.

Education Quality

1. Counselling - At remote sites, visits of faculty and administrative personnel for advising and registration sessions alleviate the efforts of the site's own staff. "Delayed talkback" whereby the student can call an instructor during his office hours also aids communication.

Keeping the camera up after the official close of class so that remote site students can participate in last minute questions also integrates remote site students into the normal classroom. Vice versa, turning cameras on early so that remote site students can see students coming in and waiting for a late instructor reassures the remote site student that he is not missing any portion of a lecture and again makes him feel more a part of a live class.

2. Facilities - a. Library - For courses with reserved reference material, a floating library is established in which duplicate copies of such materials are circulated to the sites. b. Computer access - Before being allowed to register for some computer science courses a student must insure that he has access to computer time and appropriate languages at his own site. For other courses, remote demand access is established to the university computer and the student is issued an account number similar to the on-campus student so that he can access the computer via terminal. Registration materials clearly spell out these requirements. c. Laboratory work - While typically lab courses are not scheduled for TV, there have been some successful efforts. In some instances a student will take the lecture via TV and come to campus for lab

sections. A second solution is to utilize industrial facilities for laboratory work with lab reports and occasional visits from the instructor as the connecting link. A third solution has been to develop lab kits (for example, incorporating microprocessor units) to enable the student to do lab work at his own site. d. Remote site classrooms - We have learned that any class over ten requires a separate room preferably or two monitors with two phones with extended cords in the room for a maximal learning environment.

3. Examinations - The decision is always left to the instructor about the handling of examinations, particularly on the question of taking exams on campus or at the remote site. Rigid procedures have been set up to assist those who allow exams to be taken off campus. Exams are sent to a site's registration liaison in a sealed envelope with an instruction label completed by the instructor indicating: date, time, and length of exam; open or closed notes and books; in class or take home; and whether or not the instructor will be available for questions during the exam via telephone. A receipt from the remote site proctor is required when the exam is returned verifying that the instructions have been followed. The majority of instructors allow exams to be taken at the remote sites, particularly for day courses when release time might be a problem for a student/employee. In addition, since the courses are typically upper level undergraduate or graduate, the exam type and scheduling are much less rigid than freshman level courses which may entail weekly quizzes and several major closed book examinations during a term.

Maintenance of the Faculty's Normal Classroom Role

Taking as an overriding goal the effort to make the system an advantage rather than a disadvantage, the TV network has taken certain steps to maximize cooperation from faculty members. A copyright agreement has been drafted to alleviate faculty fears about protection of their materials, and a clear statement and explanation of taping policy, (i.e., only under extraordinary circumstances, such as transmission problems or a student absent on business), is provided to each instructor prior to the beginning of a term.

More significantly, taping has come to be viewed as an advantage of teaching in a TV classroom. If a faculty member needs to be absent from campus for a professional conference, he can pre-record a lecture which is then played back at the regular class time. No classes are missed. Moreover, the faculty is learning that tapes can be a teaching tool. For instance, student presentations can now be taped and played back for immediate critiquing; an experiment in polymer chemistry gains in vividness as the overhead camera zooms in on the separation of a solution to form a nylon fiber.

Conclusion

These are on-going efforts but performed with a sense of growing satisfaction. In spring 1978, a survey indicated that 88% of the participating remote site students felt that their courses were quite appropriate for presentation via TV; and, from a grade survey made in fall 1978, it was clear that instructors had a high regard for the quality of students participating at remote sites. In a study of 10 courses (4 undergraduate and 6 graduate) a higher percentage of A and B grades were given to IIT/V students than to on-campus students (84% vs. 66%); proportionately fewer IIT/V students dropped courses than on-campus students (5% vs. 9.5%); of those dropping, no IIT/V students were on a failing basis whereas 2% of the on-campus students were; failure rates were the same for both on and off campus students (3% each of the sample).

Clearly some interaction had taken place.

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[1] See Robert E. Hoye, "Information Transmission Utilizing ITFS," EDUCOM Bulletin, Winter, 1978, pp. 12-13, for a survey of several such reports.

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A TELEWRITING SYSTEM FOR TEACHING AND TRAINING

Some Principles and Applications

by

Mavis K. Monson
Instructional Design Coordinator
Instructional Communications Systems
University of Wisconsin-Extension

INTRODUCTION

One picture is worth more than ten thousand words.
—Old Chinese Proverb—

Fortunately, the meaning of this ancient saying needn't be taken too literally when we talk about teleconferencing. In fact, the extent to which teleconferencing is being done today on a world-wide basis using voice-only audio channels is a direct contradiction. It belies the notion that one needs to have visual information to communicate effectively.* Yet, we do know that for certain types of information and in certain communication processes, the capability to produce real-time graphics (hand-drawn pictures, diagrams, letters and numbers) is an asset whose worth is incalculable.

It is for these applications, that a system which provides real-time graphics capability becomes a vital component of teleconferencing. This paper focuses on one of those systems; a system called "telewriting." Telewriting may be defined as the process of converting hand-drawn pictures or written symbols into electronic signals which are then transmitted instantaneously down telephone wires (or a similar transmission system) to be reproduced at a number of remote locations simultaneously.

The discussion of telewriting will center on the electronic blackboard. Within the area known as telewriting, there are a host of options other than the electronic blackboard such as electrowriters, graphics tablets, light pens, etc. And, there are, in addition, other visual graphics systems such as facsimile, slow-scan televideo, computer graphics and full-motion video. The limits of this paper preclude a discussion of these systems. However, a number of the design principles introduced in a later section can be applied to the successful use of all of the so-called "visual graphics" systems in teleconferencing.

THE ELECTRONIC BLACKBOARD

Based on components familiar to all of us, the electronic blackboard was developed by Bell Laboratories and pilot-tested at the University of Illinois for engineering courses. It is now being marketed nation-wide.

We had the unique opportunity to work with the blackboard on an intensive basis: exploring its capabilities and discussing its use in a distant learning environment. The information in this paper is based upon this experimental work as well as our past experience with another type of telewriting system: the electrowriter.*

The electronic blackboard is a very simple-to-operate system. Thus, little or no "training" is required for its use. Optimally, however, we would use some forethought--simply because we are working within a teleconferencing frame of reference. This means that we need to consider how the transmitted material will appear at the remote locations as well as how the visual component will be integrated into the overall design of the teleconference. Accordingly, this paper will explore these two aspects: I. Transmitting Technique and II. Designing for a Teleconference.

**For example, the Educational Telephone Network, an audio teleconferencing system at the University of Wisconsin-Extension, was in use over 1800 hours in 1978-79, with a total of more than a quarter million "contact hours" (number of program hours times number of participants). Programs included instruction and meetings.*

**The SEEN system combines audio teleconferencing with an electrowriter system. It reaches twenty-three locations within the state. Visusl material is received at locations via an overhead-type projection system so that images appear greatly enlarged on a standard projection screen.*

I. TRANSMITTING TECHNIQUE

To understand the "whys" of good transmitting, we need to know how the equipment operates. The basic components --the blackboard, the chalk and the eraser--look very similar to those found in an ordinary classroom (indeed, in the case of the chalk and the eraser, they are.). These components differ in that as they are being used in the usual way, they are also performing the "behind the scenes" electronics necessary to produce images at the remote locations.

The blackboard itself consists of two layers of tightly stretched Mylar™ which is electrically conductive. A minute gap separates the two layers. As chalk is used to write on the surface, the two layers come into contact, registering electronically as the x-y coordinate of that point. The impulse formed, along with thousands of others, is carried by the telephone line to the remote location where a memory unit stores it until it is displayed on a video monitor. Each x-y "point" thus becomes a part of a larger graphic. All of this occurs so fast that we would call the writing or graphic produced "instantaneous."

To remove a portion or all of the writing, the eraser is lifted from the tray--activating the erase mode of the unit. The physical act of lifting the eraser and using it to remove the chalk markings from the board also erases the visual images on the remote monitors.

The blackboard thus has two operating modes: "write" and "erase." The main thing to remember, then, is that any pressure on the board, whether that be from a piece of chalk (as intended for use), a fingernail or other object, will signal the equipment electronically to either "write" or "erase" depending on its mode. It is important to note, also, that since the transmission depends on electrical contact, the best quality will be obtained when stokes are deliberate--flourishes should be saved for regular classroom writing.

Legibility

Making deliberate strokes is only one of the ways to insure legibility. Legiblility becomes a critical factor because of the large difference between the size of the writing surface on which the information is originally produced and the size of the video monitor on which it will be viewed. In this case, what you see on the blackboard is not exactly what you get on the monitor, so that an instructor needs to make a conscious effort to make letters on the blackboard large enough to read well when they appear on the monitors.

(Fig. A. shows proportional difference between writing surface and an average monitor.)

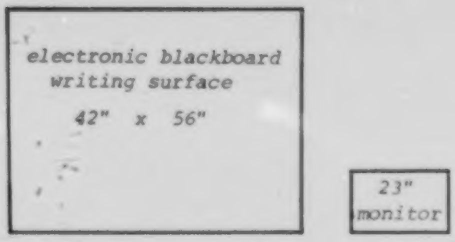

Fig. A. Proportional size difference between blackboard writing surface and video monitor (23 inch).

The work of G. F. McVey (1970) on legibility and television display suggests a number of guidelines appropriate for the blackboard. Legibility, according to McVey's studies, depends upon a number of factors: size, form, shape and dimensions, stroke width, brightness, contrast, color, illumination, and the resolution of the display system. Several of these factors--stroke width and color, for example--are not relevant to this discussion. However, size, form, legibility, etc., affect the choices a user of the blackboard might well make.

Size. McVey suggests a formula for determining symbol size on artwork to be produced for television. We would suggest that based upon this formula as well as our experimental trials that instructors begin by making letters at least 2 inches in height. Depending on the skill of the user in writing, this size can be adjusted upward or downward, accordingly.

Form, shape. Certain alphabets and numerals are so similar in shape that they are frequently confused with each other. For example, G, C and O; 3 and 8; R and B; 2 and Z. Instructors can make a deliberate attempt to make sure these particular symbols are distinct from one another.

Spacing. Lines set too closely together can be difficult to follow and reduce readability. It is generally recommended that line spacing be between 100% and 150% of symbol height.

Upper and Lower Cases. Upper case letters are more legible, lower case letters more readable. Thus, if you are producing individual alphanumerics, short statements, captions, etc., use upper case. When a great quantity of alphanumerics are presented, lower case letters are easier to read. Thus, if you are going to write sentences or any quantity of letters, use lower case.

Illumination. The amount of illumination in the viewing sector and the area surrounding the monitor are factors that will affect viewing accuracy and comfort. This particular aspect is not under direct control of the instructor but is noted here as a condition to be considered when preparing the locations for the learning experience. The reader is again referred to the work of McVey for suggestions to follow in terms of background lighting and monitor brightness.

To summarize, legibility depends on a number of factors such as size, form, spacing, use of upper/lower case and illumination.

Tracing Techniques

In certain subject matter areas such as accounting, there may be a need to precisely position lines or columns on the screen. In order to assure as accurate a transmission as possible, two options for tracing from an original graph or chart are possible:

1) Use of an acetate overlay the same size as the blackboard which incorporates a grid of 3 inch squares. The grid would facilitate the drawing of straight lines and organizing space more efficiently.

2) Use of an overhead projector or slide projector to display the visual information on the surface of the blackboard. This would enable the instructor to trace (and thus transmit) the material by following the lines projected.

Prerecording

Both the visual and the verbal message can be prerecorded using a standard two-channel audio cassette recorder. The advantages of the audio cassette format are two-fold. First, the obvious cost savings. Video cassette format runs roughly 25:1 as compared to audio, in terms of tape costs alone. (Over and above these costs are studio cameras and setups for video taping.) The second advantage lies in the ease of recording procedures. Because the recording is made directly from the impulses generated within the system, an instructor can easily do his/her own recording by following a few simple steps.

Although the procedure is simple, it is important to remember that if a recording is being made incrementally (with many "stops" and "starts") that the very first stroke when beginning the next segment must be made very deliberately. This helps to make sure that "contact" has been made to reestablish the recording process.

Ground Rules

Ground rules might be thought of as the process of providing structure or developing common expectations regarding how communications (both visual and verbal) will "happen." People react positively to ground rules in teleconferencing--somehow the mutual understanding as to when and how the message is coming, when and how to interact, etc., makes the experience more comfortable and satisfying. For example, the work of Korzenny and Bauer (1979) points out that contrary to what we might expect, in a teleconferencing setting, *"... the level of communication rules during the interaction had a positive impact on communication satisfaction."*

The exact ground rules established will, of course, depend on the individuals participating and the goals of the teleconference. However, one example of why developing common expectations is important results from the fact that at a remote location, one of the centers of focus for students will be the visual material on the monitors. Thus, ground rules for the visuals, i.e., what to expect, may well be of consequence. For example, if nothing will be transmitted for a number of minutes, the instructor could note this--either verbally or visually.

Pairing the Transmission of Visual Material with Spoken Material

The work of Severin (1967) is relevant to the pairing of the information being given verbally and visually. His research suggests that it is important for us to make sure both of the "cues" match each other to the extent that they are related or relevant, but not to the extent that they are one and the same. In other words, to have the same word or words displayed on the screen as those being given verbally will not result in better communication. As he states:

> *"Multi-channel communication which combines words with related or relevant illustrations will provide the greatest gain because of the summation of cues between the channels."*

However, it is the corollary to this relationship which concerns us even more here. If communications in two channels contain unrelated cues, it will cause *"interference between channels and result in less information gain than if one channel were presented alone."* This suggests that it is critical for the information which is displayed on the monitor to "match" in some related way, the information being transmitted verbally by the instructor. And this is why some pre-planning of the instructional sequence is a recommended policy.

Planner Concept

Through past experience, we have found that the most successful instructors using a telewriting system have a planning device of some type. The form is not the important ingredient--it is the concept of some kind of visualization process before the actual program begins--that is.

The idea of "story-boarding" is one that comes out of the instructional design process. A story-board is simply a *"series of sketches or pictures which visualize each topic or sequence in an audio-visual material to be produced."* (Kemp, 1975) A typical story-board shows the visualized portion of the message on one side and the verbal portion on the other.

For easy use, many of our telewriting instructors have developed their "planners" using 5 x 8 inch cards. (The type of form used, of course, will depend on the teaching/working style of the individual.) Cards are an easy format to work with as they can be arranged and rearranged in sequence during the lesson-planning stage. During the actual program, notes made on each card can help pinpoint problems in student understanding or visual presentation, as well as strategies that worked well. For future use, after evaluation, the cards can be rearranged, added to and/or discarded easily so that improvements in the program can be made directly from the cards.

(Fig. B. shows a suggested format for a planner card. Fig. C shows an easy way to sketch the proportional size of a video monitor.)

Planner cards help make the transition from traditional classroom teaching to teaching via telewriter proceed more smoothly. By thinking in terms of "frames," the instructor becomes aware that once an illustration has been developed, it will be "lost" in terms of review as the next illustration takes its place on the monitor. As one of the instructors using our electrowriter system put it: *"In an ordinary classroom, I just write all around the room, coming back to whatever I need. With the electrowriter, I have to think ahead. I need to remember when students may have to refer back to the start of a math problem."*

To summarize: the planner concept is a form of story-boarding which encourages instructors using the blackboard to plan and organize the visual portion of the content. The form of the planner is not important; even the direct use of the planner during instruction is not critical. What is important is the introduction to instructors of the concept of thinking about instruction in terms of the visual portion of the message--how the visual is to be presented, pacing, how much information each frame should carry, size of lettering, size ratio of the video monitor (3:4), simplification of diagrams if necessary and interrelating information on the board to other media (slides, videotapes, printed material, etc.).

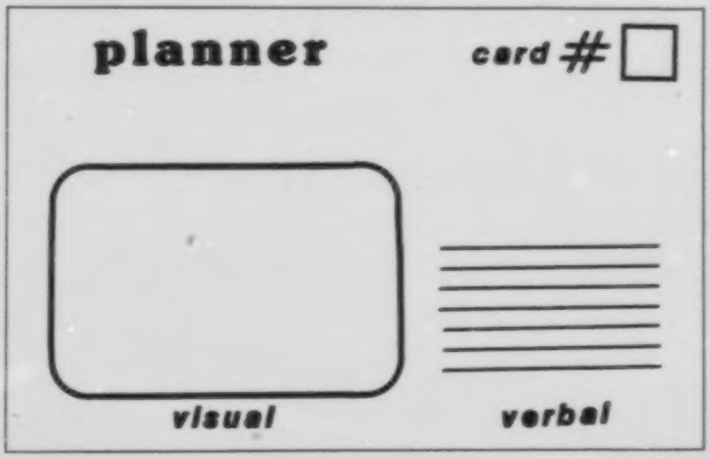

Fig. B. A suggested format for a "planner card" (actual size: 5" x 8")

Size ratio of monitor screen is 3:4. Draw a diagonal line through a 3 by 4 inch rectangle. Any rectangle formed by meeting this diagonal will be in the ratio of 3:4.

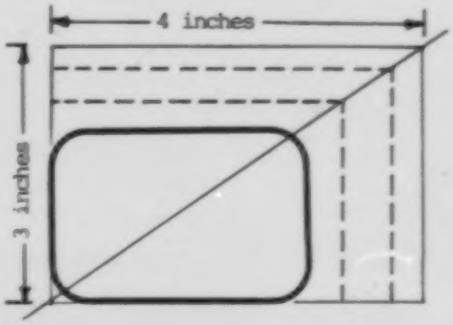

Fig. C. Determining proportional size for monitor "frame"

Summary of Transmitting Technique

To successfully produce the type of meaningful, clear visuals we want, we need to keep in mind a number of factors:

1) That although the blackboard looks like an ordinary blackboard, an instructor is actually generating electronic signals as well as chalk images. These signals will appear on a video monitor (ratio 3:4). Size of letters will appear at a smaller size on the remote monitors in comparison to the blackboard.

2) Legibility factors such as size, form, spacing, upper/lower cases and illumination are important considerations.

3) Tracing techniques, using either an acetate overlay or projecting the material via overhead or slide projector, can be used to transmit material that is precise in nature (such as accounting forms, music staffs, etc.).

4) Prerecording of both visual/audio message is easily accomplished. Entire programs might be prerecorded; short segments of complex material can be used as inserts. Format is standard audio cassette tape.

5) Ground Rules which establish when the visual (and verbal) messages will vary help provide participants with needed structure.

6) Pairing of the visual message which is on the monitor with the verbal message being given by the instructor is important to assure that "cues" are related and relevant to one another.

7) In general, most successful telewriting instructors use some form of "planner" which organizes their thinking in terms of visual and verbal messages.

(Chart A summarizes capabilities of the electronic blackboard as compared to the electrowriter [original equipment, Victor Comptometer].)

CHART A

CHARACTERISTIC AND/OR CAPABILITY	Electronic Blackboard	Electrowriter (Vict.Comp.)
Basic writing components	chalk on blackboard surface	ball-point like pen with mechanical linkage on paper platen
Writing surface	42" by 56"	3 1/2" X 5"
Viewing surface	tv monitor	projection screen
Real-time: provides "building" of graphics, revisions, clarification, pacing	yes	yes
Prerecording option: prerecords can be edited, used as inserts, replayed for independent study	yes	yes
Tracing techniques to provide more exact visuals	yes	limited by writing area
Can be combined with other media such as slides	yes	yes, use with care because of high contrast between lighted screen and slide
Ability to underline, draw arrows, etc. for attention, repetition, clarification	yes	yes
Ability to erase all or portions of graphic for attention, emphasis	yes	no
Capability of having one site add notations to visual display on monitor	yes, w/ each site equipped with BB	very limited because of writing area
Hard copy (paper or acetate) available for review	yes, w/ special add-on equipment	yes, automatic paper and acetate copies

II. DESIGNING FOR A TELECONFERENCE

Now that we have explored the considerations important in the transmission of material, let us turn to another fundamental area in the success of a telewriting teaching/training session: designing a teleconference.

We would like to introduce in this section a model for design--a model that suggests guidelines for adapting instruction to a distant learning environment.

Although teleconferencing classes are in many ways the same as those taught face-to-face, they are, as one would intuitively guess, different in others. The unique characteristics of the teleconferencing setting which relate to the design of instruction are:

- individuals are physically distant from one another
- they are using telecommunications technology to interact with one another
- they may be initially uncomfortable in using the technology or may have different expectations of what the experience will be like
- they may be participating in a group or be all alone at a location
- individuals cannot see one another as they communicate.

These characteristics of the teleconferencing environment provide some basic guidelines to use in thinking about designing instruction so that it is effective and satisfying. For example:

1) Listening "groups" aren't always a group.

When students are dispersed geographically at many locations, it may be difficult to develop a "one group" rapport. Getting-to-know-someone is not as easily accomplished in teleconferencing as it is in a face-to-face setting.

2) Discussion doesn't "just happen."

No matter how much students may want to make use of the opportunity to ask questions (and no matter how easy it may be to use the technical equipment), some students are reluctant to interact at first--they may feel they are infringing on program time, on other people's time, or that their questions or comments may not be worded correctly.

3) People don't listen very long

It is hard work concentrating on a one-way message very long. For adults, that "very long" is not much more than 12 to 15 minutes. For children, the time is even shorter.

4) Communication isn't complete until we get feedback.

In any communication with others, we haven't completed the "loop" until we know that the message has been received and understood. In teleconferencing, non-verbal cues from individuals are not available as a feedback mechanism.

In many cases, an effective teacher in a face-to-face setting will intuitively recognize the differences inherent in teleconferencing and quickly adapt by incorporating new communication techniques into his/her teaching style. However, to help new instructors make the transition as smoothly and rapidly as possible, we have organized what we know from the research and what we have learned from the experiences of those instructors who program on our network--into four design components:

HUMANIZING

PARTICIPATION

MESSAGE STYLE

FEEDBACK

To operationalize these components in a teleconference, we provide instructors what we call "hip pocket" techniques. These hip pocket techniques can be incorporated into instruction to adapt it to teleconferencing. Later, after some initial success with the medium, an instructor may wish to work more in depth on polishing his/her teleconferencing technique.

To demonstrate how the techniques might be used in a teleconference using telewriting, we will briefly define and discuss each design component, and then suggest a number of ways to use the blackboard in implementing some of the strategies.*

We will focus on the electronic blackboard in this paper. For a more detailed description of how to design for an audio teleconference see: Bridging the Distance or TELETECHNIQUES, An Instructional Model for Interactive Teleconferencing.

HUMANIZING

Humanizing is the creation of an environment which emphasizes the importance of each individual and overcomes any barriers of distance by generating a feeling of group rapport.

How important is humanizing? It may or may not directly affect communication effectiveness but it's very important when we talk about the "satisfaction quotient," that is, how well people like teleconferencing. However, an added benefit of humanizing is that in gaining information about the members of your group, you influence the effectiveness of your communications with them.

One of the main ways of beginning to humanize is to establish some type of personal information base about group members. This may help counteract the feeling expressed by some participants that teleconferencing is "less personal" than face-to-face settings.

Instructors can develop a roster list of locations with information about each individual at the sites. By using names from the roster when calling on individuals, the instructor can make a beginning step in the getting-to-know-each-other process.

If the instructor is not able to visit each location at some time during the series--a highly recommended practice--then providing a slide or picture of him/herself will help students associate that individual with the voice being heard. (Ongoing classes have sometimes even shared roster lists and pictures of all students participating, via a "round robin" circular.)

Another key to successful humanizing is the use of a "local facilitator." This individual's responsibility is to assure that students feel comfortable with this new learning experience, help orient them to the use of the equipment, see that any materials needed for the session are available--in short, see that "all is well" at the local site and serve as a link between the students at the distant location and the instructor.

The success with which humanizing strategies are realized has a direct influence on participation of the group members.

Some "hip pocket" techniques for

HUMANIZING

☐ Use the blackboard during an "informal roll call." To create an informal, friendly atmosphere and to give students a chance to become accustomed to using the microphones, ask for a few responses from selected locations. During the first session, use the blackboard to add interest. Sketch a map. As you talk with individuals at each site, note the name and approximate point geographically of that group.

☐ Introduce yourself. Don't be afraid to use the blackboard as an extension of your personality. Use it during the first few minutes of the program to create an atmosphere for learning and to "humanize." Use it to introduce yourself--your name, your course, perhaps some phone-in "office hours." If your personality allows--you might add a touch of whimsy by sketching a picture of yourself on the blackboard.

☐ Remember your remote locations. If you're like most instructors, you'll want to have students with you at your home location as you teach. If so, you'll want to make a special effort to treat both home and remote locations alike. Remind your face-to-face group to use mikes when speaking so that distant groups can hear the questions. And make sure your instructions and references are tailored to a teleconference by using the blackboard to note any special instructions or important points you wish to make.

☐ Continue to use names. Remind individuals to identify themselves by name when they speak. Continue to use names as you talk with individuals. People like to be recognized by name; it is an especially important courtesy in teleconferencing, as it links a personality with a voice.

PARTICIPATION

Participation is transcending technological factors to allow a more natural interaction to take place--by providing for and encouraging opportunities to communicate on the part of students.

We want active participation because we know it is important in any learning or communications process. Two guidelines that might be noted in thinking about teleconference participation are:

1) Participation opportunities and strategies should be carefully planned in advance of program time.
2) Participation involves not only encouraging group members to contribute to the program, but also the vital process of interacting with the content--what you are saying and the visual material you are providing via the blackboard or other media.

The first guideline tells us that participation doesn't always "just happen" in teleconferencing. Studies suggest that there is an automatic training over time in which individuals consciously and unconsciously adapt their ways of communicating as they use an interactive system. However, some individuals adapt more quickly to new situations; others may need encouragement to do so. Building participation formats into the program is one way to help assure that interaction will take place. Asking some individuals to be responsible for taking the lead is another.

Our second guideline concerns the fact that most of us think of participation as the kind in which we see an individual or a group engaged in an activity of some sort: asking a question, making a comment, jotting down notes. Seeing the activity gives us confidence that the person is in the process of actively hearing and remembering what is being said.

However, the unobserved participation such as active listening (anticipatory alertness) and mental work in thinking about a problem are important processes. By skillfully using questions, both written and oral, and by guiding group members in some mental exercises, you can stimulate this internal participation.

Some "hip pocket" techniques for

PARTICIPATION

☐ Get specific groups involved. Ask a group at one of the locations to be responsible for the answer to a specific question to be presented at the next session. This responsibility encourages students to sit down and talk with one another after program time. Cooperation is fostered--and there is a built-in leadoff for the next program's discussion. If there is a blackboard at each location, have the groups use it as they present their answers.

☐ Stimulate participation. Stimulate individuals to interact with what you are presenting. Leave some portion of the materials to be completed--or erase a portion of what you have written--so the group has a chance to do a little mental "filling in" of your presentation. Put a thought question on the board to get small groups discussing at their own locations.

☐ Use the blackboard as a participation tool. Put a list of key points on the board. By giving your students a "sneak preview" of what you are going to cover, you can create the kind of mental anticipation important to learning. You can use the "key points" technique as a discussion starter too. Jot down some points you think might need more clarification--ask group members to select one or two they'd like to see discussed.

☐ Present interactive formats via the blackboard. Use formats which encourage participation. Almost all types of participation formats have been used successfully in teleconferencing: case study, interview, panel discussion, role playing. Provide the background necessary to introduce these formats by writing it on the blackboard. Continue to use the board as you elicit participation from the group for illustration and key point summary.

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MESSAGE STYLE

Message style is presenting what is to be communicated (both visually and aurally) in such a way that it will be received, understood and remembered by participants.

Basic to understanding how to design a message is the realization that at any given moment, we will have the full attention of only a fraction of our audience. The reason for this is simple--the differences between the rate at which our brains process information and the rates at which we can give that information--either by speaking or writing. Because the brain processes at a much faster rate, there is a temptation for it to sidetrack and go off on a thought quite different from the subject at hand. Accordingly, pacing and repetition within a message become important considerations.

Research points out the strong link between interest in--and retention--of subject matter. Unfortunately, research doesn't give us many clues as to how to generate and maintain that interest! We do know that variety can be one way. If things are too orderly and logical, they become routine quickly. Thus, a point-by-point lesson, although "well-organized," may not have the excitement of one more spontaneously presented. (An exception would be, of course, the necessary organizational structure inherent in learning a series of concepts which form a hierarchy.)

If learning is presented in a more "disorganized" fashion to provide interest and variety, we need to remember that an underlying structure is important. Ausubel's work with advance organizers has demonstrated the value of general, abstract overviews of the content. Research in listening shows that verbal cues which emphasize the important ideas the speaker wants remembered increase their retention dramatically.

Based on our discussion of attention span and the need to keep interest levels high, we recommend the concept of the "short learning segment," i.e., presenting the material in smaller bits of information, interspersed with question-and-answer or other activity. We would define "short learning segment" as approximately 10 to 15 minutes.

Message style, then, should be a combination of some structure (advance organizers and verbal cues--repetition and emphasis) as well as variety to add interest.

Some "hip pocket" techniques for

MESSAGE STYLE

☐ Plan ahead for visual communication. Use the "planner" concept to gear you for what you are going to "say" visually. It's important that what's on the blackboard complements the information you are giving verbally. Plan your topics for short learning segments--about 10-15 minutes. Note on your planner where questions might naturally arise in the minds of your students--or ask your participants to interrupt as you go along.

☐ Make creative use of the blackboard. Use an advance organizer--an overview of the material you are going to present by putting key phrases on the board. Use the blackboard to compare and contrast objects you draw, present sequential time segments relating to a single event, give meaning to an abstract idea, emphasize a fact or concept, or illustrate relationships such as parts to a whole.

☐ Use the blackboard for emphasis. Use repetition and summary to help individuals remember the message. Use the blackboard to provide some of this repetition by placing words, phrases, or diagrams on the board. Repeat any new words, concepts or phrases at least three times during an hour program. New words can be spelled out on the board for better understanding.

☐ Remember to use the prerecord capability. Do you have a drawing that is a bit on the complex side--one you would like to have come out "perfectly?" Use the prerecord capability. Tape the visual portion ahead of class time. When you're ready for that complex visual, you'll be all set. The prerecord technique lets you relax at program time--as well as for all those "next times" because you can use the tape you made over and over.

FEEDBACK

Feedback is the process of completing the communications loop which enables both speaker and listener to correct errors and omissions in the message.

How important is feedback in teleconferencing? It's an essential ingredient, just as in any other communications process. It is important to consider the mechanisms that might be incorporated into a program, because with members of the group physically separated from you, you won't have nonverbal cues to rely on.

The easiest way to incorporate feedback is, of course, to make use of the "short segment" concept and after each natural division in the material, ask questions. Was the message too fast? too complex? clearly explained? These questions may be asked spontaneously or by asking for feedback from some individuals.

Feedback's importance cannot be overemphasized. Whatever the teleconference's objective, people want and need to know "how they are doing." Channels other than verbal communication during the program can provide some of the feedback--a personal note, phone-in office hours, comments on homework, a "feedback form" (prestamped, preaddressed form provided with class materials). All are ways to keep communication channels open.

The simplest form of feedback, so obvious it's often forgotten, is a brief verbal acknowledgment whenever a comment is made by a group member or whenever a question is answered. For example, "Yes, I see," or "Fine" (or whatever phrase is appropriate) is feedback in its most basic form, but it's important because it tells participants that the message was received--and helps the flow of communications.

Another type of feedback often forgotten is self-feedback. This can be an excellent tool to improve next week's or next year's program. Many instructors use the previous program tape to do some self-diagnosing. During the actual instructional process, the pacing usually doesn't allow an individual to observe what's happening. By listening to and watching the tape of the session, instructors can catch both strengths and weaknesses of the program. Did the message come across with enthusiasm? Naturalness? Were opportunities for participation provided? Did individuals take advantage of those opportunities? This type of feedback can be as important as that received from the program participants.

Some "hip pocket" techniques for

FEEDBACK

☐ Ask for feedback. Make use of the interactive capability--verbal (and if you have blackboards at each location--visual) to ask for feedback. Check on your pacing and the quality of the reception at the locations. Use a "test pattern" to check out the monitors at each location. This can be prerecorded and played back just before the program begins--or as part of your opening informal roll call.

☐ Assign feedback. Because individuals new to teleconferencing may be shy about giving feedback, preassign it. Call several students in advance of the program and ask them to be responsible for feedback--on content, process--and the technical quality. Another alternative is to prerecord an entire program, allowing you to visit one of the sites to observe. Use the audio system at that location to interact with other sites.

☐ Use on-the-spot application of information. Find out if the material being presented is relevant to participants' situations. Pause several times during the presentation to ask one or two participants to briefly comment on the value of the information. Would the person use it? If so, how? Although this technique would not be applicable in certain subject matter areas, it can be very meaningful in many continuing education courses. It stimulates others to think creatively about their own applications.

☐ Listen and look at tapes. Teleconferences tend to be concentrated action--with little time for reflection. You may miss an important ingredient in the program because of your involvement in it. Tape your program--then review what happened during the session at your leisure.

SUMMARY

In this paper we have explored a number of principles and applications regarding the use of a telewriting system for teleconferencing, specifically the electronic blackboard. Two major aspects were discussed.

Under "Transmitting Technique" we focused on the considerations critical to successful use of the blackboard in reproducing the telewriting itself. Such topics as basic operation, legibility factors, tracing techniques, prerecording, ground rules, pairing visual/verbal transmission and the "planner" concept were discussed.

In the section entitled "Designing for a Teleconference," we presented a model for adapting instruction to a distant learning environment. Basic design components of Humanizing, Participation, Message Style and Feedback were defined and illustrated by simple techniques incorporating the blackboard.

The electronic blackboard is one of the electronic tools which will enable an instructor to reach beyond the single classroom by providing the capability to present that proverbial "picture" that we talked about at the beginning. With good transmitting technique and good teleconferencing technique, that picture, then, indeed, may be worth more than "ten thousand words."

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INCREASED EFFICIENCY AND PRACTICAL APPLICABILITY OF TEACHING-LEARNING RESEARCH THROUGH INTERACTIVE SYSTEMS INTERVENTION: A PRELIMINARY INVESTIGATION

Don Beckwith
Associate Professor and Coordinator
Educational Media and Technology Programs
Kent State University
Kent, Ohio 44242

> *I am, then, a process; and all my conceptions of selfhood, personal identity, reality of being, are shifting moments and elements of the process.*
>
> *Hodgson*

Introduction

Thus it goes; education exists; learning takes place, to a greater or lesser degree; teaching and the other manifestations of educational theory continue to facilitate and impede learning; educators are thwarted, by the very structure of their inquiry, in their attempts to determine which is or is not doing what.

Statement of the Problem

Research into the teaching-learning processes has been hindered by (1) the lack of capability and interest of students and teachers in the traditional research modes (Kramer, 1974), (2) the length of time from hypothesis generation to application of disseminated results (Embry, 1979), and (3) the limited generalizability of results emanating from tightly-controlled experimental variables (Cronbach, 1975; Ebel, 1967; Pereboom, 1971). Traditional research designs, by imposing a "constancy of change" (Enzer, 1977, p. 29), seem unrealistically restrictive.

Purpose of the Study

The purpose of the study is to conduct a preliminary investigation into the potential effectiveness of an intervention research methodology which combines (through interactive media) elements of targeted and untargeted research methodologies, is simple enough for students and teachers to conduct (during the teaching-learning process), is rewarding enough to stimulate student and teacher participation, and reduces to a fraction the research process and application time. As suggested by Clark (1979), this is an attempt to advance teaching-learning research methodology through inquiry.

Background

Experimental Research

Particular concern has centered around the limitations of traditional experimental design. Tightly-controlled experimental variables, for example, appear to markedly restrict the retest reliability of findings (Barr, 1929; Calkins, et. al., 1978; Shavelson & Dempsey, 1975). Experimental design, too, seems to be lacking in its ability to identify the "process variables that could improve teaching" (Scriven, 1977, p. 189). There has been a cry for something other than a research model from the pure disciplines, something, rather, that reflects and is appropriate to the practice of education (Becker, 1977; Clark, 1979; Shulman, 1970; Winn, 1975). In short, it seems that the educational community could benefit from alternatives to the structure of research design, the research establishment, and the training of researchers (Shulman, 1970).

Ethnographic Research

One such alternative - ethnography - has been gaining popular momentum as a classroom research methodology. Ethnography attempts to fill the desire for research designs of a more untargeted, representative, and ecological nature, designs that examine learning in its natural settings and in nonmanipulative ways (Brunswick, 1956; Cattell, 1966; Sells, 1966; Snow, 1974). By employing a descriptive methodology fashioned to accurately and objectively record all components and their interrelations occurring naturally within the teaching-learning processes, ethnography seeks answers to questions concerning the nature of teaching, socialization, and the classroom culture (Green & Wallat, 1980). While the ethnographic methodology has been a successful sociological tool of long standing, perhaps its foray into the society of the classroom is still too recent for valid evaluation. There are, however, those who say we must move away from a descriptive methodology toward a prescriptive methodology (Reigeluth, Bunderson, & Merrill 1978).

Action Research

Another alternative - one that has enjoyed sporadic and periodic attention and/or acceptance since its conception in 1946 (Lewin) is action research (Sanford, 1970; Trist, 1976), sometimes labeled intervention research (Argyris, 1970). Defined by Seashore (1976) as "any professional intervention from a social or behavioral science perspective in the ongoing processes of a socially structured entity (designed to generate) new knowledge of any kind and form that can be incorporated into the preserved and transmitted body of scientific theory, method, and practice" (p. 103), action research is specifically targeted to bring about positive change. Labeled by some as a glorified methodology of change or development, action research, too, has potentially limiting factors: (1) the researcher's advocacy for the change process, (2) the researcher's advocacy for the substance of change, (3) the noncomparability of the observation methods used (thus limiting communication and interpretation), (4) the lack of appropriate analytical strategies (Seashore, 1976). Action research attempts to avoid the consequences of the tightly-controlled experimental design by broadening the observed environment, thus answering a call for more leisurely comparison of systematic variations in process (Baker & Alkin, 1973); and replaces the detached observation of descriptive designs by including obtrusive observation and feedback of information to the subjects (actors).

Other Research Potential

There have been, of course, many other alternative methodologies proposed. One in particular - Winn's (1975) proposed open-system model of learning - being sufficiently unique, merits some discussion. Winn, in reacting to limitations inherent in looking at one or two variables in isolation, which denies "the complexity and totality of the whole learner", (p. 23) suggests that the macrovariables of learning found in natural multivariate settings be studied. Going beyond the cybernetic model of self-regulation and equilibrium-seeking, Winn's model attempts to serve as catalyst for learner-dynamism and autonomy. By broadening the treatment element of educational research through such a systems model, one might be able to go beyond the study of aptitude-treatment-interactions to the study of aptitude-systems-interactions, structure-treatment-interactions, and structure-systems-interactions. The open-system model appears to address many of the weaknesses of traditional research methodologies; a viable implementation strategy is, to date, lacking.

Summary

In recent years the educational research community has evidenced a growing dissatisfaction with the traditional research methodologies typified by experimental design. There seems to be a trend away from the tight control of a few carefully selected variables toward more and more of a multivariate approach, an open searching for relevant variables, during real time, and within a dynamic systems context; a trend away from artificially manipulated environments to more and more natural and representational environments. While the methodologies of the past are far more complete and thus far more logically and wholistically defensible, the newer methodologies offer some promise of alleviating the constraining limitations of experimental design methodologies.

Passive observance, recording and study of dynamic systems seem inappropriate; when the researcher is detached from a system, being thus unable to enter or interact with the system, he must rely upon static research methodology. Thus, the movement seems to be toward a systemic research methodology, one that loses all probability of contaminatability by its embracing of all variables; one that is able to look at complex systems (learners) within complex systems (learning environments) (Garner, 1962).

Toward a Dynamic Proactive Research Methodology

The educational world, its people, and the variables within and without those people are changing so quickly, so drastically. Perhaps unless we remove the static elements from research methodology and replace them with dynamic elements we might never be able to test the extremes before they change; we might never be able to generalize to the whole in time.

Culling some of the stronger elements of the methodologies discussed and combining them with some original elements, the researchers have created the beginnings of an explorable research methodology to deal with the problem of being able to perform research during real time, within dynamic systems, while attending to internal validity.

The Philosophical Basis of the Proposed Methodology

A set of underlying systemic assumptions aided in the formulation of the methodology. It was assumed that each and every classroom and each and every learner may be viewed as a world in and of itself, not only as a world that is but also as a world that could be. Even though the class/learner (world) will hold together as an entity in spite of what educators may or may not do, its finer potential lies in its capability for becoming what it wishes to become. In any class/learner the ingredients are all there, even if some of those ingredients are knowing that some of the essential ingredients are not yet there; the potential of all ingredients is there. The class/learner is capable of transcending itself into a purposeful whole.

Some further underlying assumptions: (1) Every student could benefit from the opportunity to cultivate a more effective and efficient learning style; (2) each individual, as he goes through life, searches for and builds upon his own learning style. Most learners have not reflected upon the elements/strategies of such a style, but rather it is built as a result of lifelong trial and error learning process; (3) through additional awareness and repeated analysis (more and more sophisticated) of his own learning behaviors (bits of strategies to begin with; then, perhaps unconscious rules) the student should become conscious of his own process (learning style) its limitations, deficiencies, strong points, and the resources (human and nonhuman) that he relies upon. It will also allow him to make some determinations concerning desired change(s) in his behaviors, i.e., his learning style; (4) learning styles must be the result of self-imposed evolution, rather than other-imposed. It must evolve from within, using and tempering input from within and without; (5) the amount of learning taking place has nothing to do with the type of material presented or within which mediated form it is presented, but rather how the learner selects bits and rearranges, connects to bits previously selected and anchored. The key might be not to individualize in the tried sense of the word, but rather to structure the learning environment so that each individual can individualize his/her own learning; (6) the structuring of an environment to effect such awareness, analysis, building toward a higher level of conscious sophistication is feasible through the use of interactive media (human and nonhuman); (7) individuals can quickly learn to monitor and modify their learning style behaviors; (8) there are some techniques that are more beneficial toward effecting one's and/or others' optimum learning styles (self-to-self, self-to-others), others-to-others); (9) individuals are capable of ethnographically recording and classifying behaviors, thoughts and feelings of self and others through (a) live observation, (b) internal reflection, (c) videotape observation, and (d) sharing observations and reflections.

The Exploratory Methodology

The exploratory methodology includes an interactive structure to facilitate (1) hypothesis generation, (2) inquiry, (3) informal experimentation, (4) analysis and critique, (5) systematic development of the essential components of the learning styles, (6) sharing positive and negative findings, (7) determining and effecting each next step in the process (Monte Carlo fashion), and (8) creating learning environments conducive to the continued developing/evolving learning styles. The interactions are further designated as either man-man, i.e., student-student, student-researcher, teacher-student, or student-self; man-machine, i.e., student-video tape, researcher-video tape, teacher-videotape, student-computer, researcher-computer, teacher-computer; or machine-machine, i.e., computer-video tape (Heinich, 1970).

The interactions at times are "forced", i.e., the environment is structured to facilitate interactions between men and machines, either initiated by the individual learner (internal-external) or by a man or machine other than the learner (external-internal). At other times, interactions are modeled by men and/or machines other than the learner (external-external). At still other times, the interactions are the result of suggested reflection during which the learner interacts with his own thoughts (internal-internal).

Interactive Systems Intervention

The key to success in such a venture lies in going beyond the maintenance and preservation of the dynamism of the system being studied to the increased eliciting and exposure of the usually unobservable dynamics of the system, what Weiss (1950) calls the human nature that is the force and meaning behind/beneath human behavior. Since today's technology includes, in addition to some rather sophisticated intervention systems, some interactive media that have remarkably creative potential applications, it seems possible to attain this Weissian end through the intervention of interactive media.

It is through such intervention that collapsing the element of time between the typically separate activities of research and application is possible. Further, through interactive media, it is hoped that evolution from teacher-environment dependency to self-controlled learning is possible. Looking for media that could both facilitate interaction and serve as partners in interaction, the selection was narrowed to video tape playback and home-style micro-computer systems.

Comparison to Other Methodologies

In the sense that mini-hypotheses are generated and tested daily (by the researchers, by the learners, by the teacher) the methodology is somewhat experimental.

In the sense that detailed observation techniques are employed, the methodology is in part ethnographic.

In the sense that goals are set, intervention is used as a catalytic strategy, and everything is made public to all, the methodology is in part action.

In the sense that the learner is viewed as a dynamic whole and the class is also so viewed, with all elements being interrelated and interdependent; and thus the learner, in building his learning-style system, begins wherever he is, the methodology is in part a manifestation of the open-system model of learning. Within such a framework, each student thus creates a productive system from a nonsystem, i.e., he/she consciously and purposefully builds an efficient and effective learning style.

In the sense that the procedures are very loosely structured and cannot be predetermined during the initial research stages, the methodology is in part untargeted.

In the sense that there is a desired goal, that of finding the critical elements and interrelations of elements within the evolving learning style, the methodology is somewhat targeted.

In the sense that it is open, honest, and public and allows the learner to create his own system, and in the sense that human values transcend the technology (Hoban, 1977) the methodology is in part humanistic.

The Roles of the Various Catalytic Elements

In structuring a classroom environment that would provide a stage for untargeted exploration, in order to examine the various catalytic possibilities, probabilities, and capabilities of interactive media, researcher, teacher, and learner for effecting successive approximations toward more sophisticated, self-elaborated learning styles and to ensure optimum information generation, the following roles were established.

The role of the teacher: to perform his teaching function through a series of mini-lessons of directive and nondirective teaching strategies, i.e., lecture, lecture-recitation, guided discussion, open discussion, brainstorming, small group consensus decision-making, discovery, inquiry, open exploration.

The role of the learner: to tabulate, through self-reflection and self-observation, his/her actions and thoughts during each mini-lesson; to hypothesize how he/she learned what was learned during each mini-lesson; to hypothesize which, if any, of the tabulated actions and/or thoughts positively contributed to the learning; and to share with others his/her perceptions, progress, insights, and confusion.

The role of the interactive media: to provide a means for the learner to monitor his evolutionary awareness of and creation toward more sophisticated learning styles; to allow the learner to build and maintain (through the accumulative storage-retrieval nature of the media) a growth spiral toward the desired goal.

The role of the researcher: to establish facilitative guidelines for learner tabulation, self-reflection, self-observation, hypothesizing, and sharing; to coordinate the catalytic spiraling so that each (teacher, learner, interactive media) is building upon the catalytic attributes and feedback of the other two; to use learner hypotheses, perceptions, and insights to modify each next episode accordingly; to maintain, through monitoring of all catalytic elements, an atmosphere of disequilibrium and inquiry.

The Management Procedure

As the coordinator of the catalytic interrelations, each building upon each other toward more sophisticated levels, the researcher needed a management structure from which to operate. Borrowing from Lewin's (1946) rational social management procedure for action research, i.e., repeating series of spiraling steps, each series including planning, action, and fact-finding about the result of the action; and elaborating it via Seashore's (1975) awareness of the exploitation of time and Monte Carlo Analysis Forecasting (Enzer, 1977; Hencley and Yates, 1974), a procedure for structuring the setting was created.

The actual procedure for structuring, extracting, analyzing, restructuring, and synthesizing information consisted of the following series of short, cyclical steps: (1) Researchers alert learners of the focus, goals, and steps of the exploratory research; (2) Researchers prepare learners for reflection and recall (guidelines read and discussed); (3) Teacher conducts mini-lesson (lecture) (videotaped); (4) Learners view videotape playback of mini-lesson; (5) Learners fill out recall and reflection form anonymously but with self-selected code number; (6) Researchers extract information from recall and reflection forms; (7) Researchers determine next set of activities; (8) Teacher conducts mini-lesson (lecture-recitation) (videotaped); (9) Repeat steps 4 through 7; (10) Teacher conducts mini-lesson (guided-discussion) (videotaped); (11) Repeat steps 4 through 7; (12) Learners share perceptions, in small groups (of 3-4) by selecting, through consensus, actions and thoughts that enhance learning from those extracted, and then rearranged and amalgamated, from rounds 1 and 2; (13) Researcher extracts information from consensus exercise; (14) Repeat step 7; (15) Teacher conducts triple mini-lesson (reading silently for comprehension; answering study notes, silently, about the material read; comparing answers in a class discussion) (videotaped); (16) Repeat steps 4 through 7; (17) Maintain spiraling.

The Preliminary Investigation Sample

For this exploratory study the researchers asked teachers to volunteer themselves and their classes. (The volunteer teachers indicated that such a study might be beneficial to them and their students.) Of those classes volunteered (English, psychology, math, health, reading, history, and biology, at various 7th through 12th grade levels) one 8th grade American history class was selected as a starting point. The heterogeneously grouped class was comprised of 14 students, 7 boys and 7 girls, ranging in age from 13-14. The school, Cuyahoga Heights High School, is located in a blue collar suburban (outside of Cleveland) community with a high industrial tax base.

Findings

1. During round one: (a) Each of the 14 learners hypothesized that his/her learning had occurred as a result of taking notes and/or listening; (b) very few actions circled (those thought to contribute to learning) were not directly related to the unanimous "how I learned" response. The four exceptions were, "watching the teacher", "looking at neighbor", "moving feet and hands", "asking questions", each appearing only once; (c) of the 13 thoughts circled (those thought to contribute to learning), nine were directly related to the unanimous "how I learned" response. The exceptions were, "I have homework tonight", "I didn't know that", "This is confusing", "counting the letters in transcendentalism"; (d) far more actions and thoughts were listed and uncircled (not perceived as contributing to learning) than circled, a four-to-one ratio.

2. During round two: (a) While seven of the learners repeated their hypothesis of round one, i.e., that they learned as the result of listening and/or taking notes - three learners expanded somewhat upon the listening/taking notes hypothesis ("and reading over my notes", "and then watching myself on tape", "and then writing it in my own words"); one learner introduced a new hypothesis ("seeing what you're doing wrong and hearing it again"), and two learners indicated a lack of learning ("was confused about certain words", "not really paying

attention like I should"; "looking serious but really not"); (b) in addition to those actions circled that seemed to be directly related to the learners' hypotheses, i.e., "wrote on paper", "took notes", and "listened", there were eight circled actions that seemed not directly related to the learner hypotheses (scratched head", "looked at neighbor", "slouched", "frowned", "looked at clock", "yawned", "laughed", and "looked around"); (c) only four thoughts were circled to indicate a positive relation to learning. One of these - "I can't wait 'till lunch" - was not directly related to the lesson content; the other three - "What's he talking about?", "I didn't know that." and "This is boring." seem more related; (d) the ratio of uncircled actions and thoughts to those circled remained at four to one;

3. During the consensus round - wherein the learners in teams of 3-4 were asked to circle those actions and thoughts compiled from all of their round one and two forms which were perceived as contributing to learning - the findings were varied: (a) Those actions that all four teams or three of four teams agreed were positively related seemed more directly related to the earlier hypotheses (i.g., "taking notes", "asking and answering questions", "concentrating", "listening", and "watching teacher") than those actions selected by only one or two teams (e.g., "looked at neighbor", "erased", "shook my head", "hardly looked up", "smiled", "crossed out"); (b) nine of the 22 actions circled by one or more of the four teams had not previously been circled by anyone; (c) those thoughts that all four teams or three of the four teams agreed were positively related seemed more directly related to the earlier hypotheses (e.g., "I'd better take notes.", "How do you spell that?", "I wish he'd talk slower.", "I hope I remember what I'm thinking.") than those thoughts selected by only one or two teams (e.g., "I was surprised." "my favorite class", "This is tiring, but it's interesting.", "I have homework tonight."); (d) thirteen of the 36 thoughts circled by one or more of the four teams had not previously been circled by anyone;
4. During round three: (a) Only four of the 13 learners repeated their hypotheses of rounds one and two, that of learning via listening and taking notes. Of the remaining nine, eight created new hypotheses (e.g., "by working on one idea with other people", "by relaxing in front of the camera", "by thinking about what I said", by arguing with someone else and getting their point of view"), and one learner "didn't learn good today"; (b) in addition to actions previously circled, e.g., "taking notes", "listening", new actions emerged in "talking to my group" "arguing," "disagreeing"). These seemed related to the new hypotheses; (c) of the 63 actions listed only 12 were circled as positively contributing to learning; (d) of the 58 thoughts listed, only seven were circled. Of those seven ("I thought about what we were talking about.", "concentrating on the subject," "I know how to do that," "Now, this is easy", "This is confusing", "I'm hungry", "I didn't know that."), most were directly related to the new hypotheses.

5. During rounds four, five, and six (administered back-to-back and recorded together on the Recall and Reflection form): (a) The hypotheses stated were quite diverse: (1) reading, writing, thinking; (2) watching what I did while I was reading to help me concentrate more; (3) reading, writing, and discussing the answers; (4) comparing my answers to the right ones; (5) having teacher come over and help me on my paper and tell me about it; (6) concentrating more because I thought the subject was interesting; (7) reading, listening to my teacher, asking a question and answering questions; (8) being interested in the subject; including one ("learned bad; didn't do many things that would make me learn") that was less than positive; (b) Of the 24 actions listed, none was circled; (c) of the 75 thoughts listed only four were circled; those four ("I can't wait until my dentist appointment.", "They have French fries today; I'd better hurry.", "about what a fool Kelly is sometimes and I wondered what she wrote", "I'm glad insane people aren't treated like that now."), only one seemed directly related to a hypotheses.

After completion of the preliminary investigation, the learners: (1) Expressed a strong desire, through repeated requests, to view the final videotape; (2) asked, repeatedly, when they would be able to continue to build their learning styles.

Tentative Conclusions

While this study was merely exploratory in nature, there appear to be some rather tentative conclusions that may be drawn from the findings: (1) The repeated process of participation - viewing - recall/reflection - hypothesis generation seems to progressively and systematically increase the diversity, uniqueness and strength of individually generated hypotheses; (2) Viewing one's own and others' actions on video playback seems to enhance the ability to relate one's actions and/or thoughts to his/her learning; or, conversely, not viewing seems to inhibit this ability; (3) Self-analysis, through recall and reflection, appears to be positively addictive; (4) The exploratory research methodology seems to hold promise.

The Next Steps

By the time this paper is published, the researchers will have broadened their investigation to include exploration into: (1) the effect of viewing slow-motion video tape playback upon one's self-analysis skills, (2) the effect of communicating with other students through the use of a home-style micro computer upon one's ability to generate and test a variety of building hypotheses related to individual learning styles. It is hoped that interactive media will demonstrate increased potential for effecting desired and proactive research results.

> *. . .to aid ourselves to a better life, we need expect nothing from heaven or from earth: we need only to cease from ways that result in our own loss.* *Tolstoi*

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COULD GRANNY GET MEALS ON WHEELS?
REQUIREMENTS FOR NEW INFORMATION SOURCES AND MEDIA IN THE RESIDENTIAL SECTOR AND METHODOLOGIES FOR THEIR STUDY.

K P Szlichcinski
British Post Office Long Range and Strategic Studies Division*
Cambridge
England

The British Post Office has for many years supported fundamental studies of the demand for new communications media. The term 'fundamental study' is a loose one, but it may be defined as any study of communications behaviour and media use investigating the factors which underlie communication behaviour and are independant of familiarity with specific media. Studies of this kind yield a richer understanding of needs for communications media or services than simple market research and provide a basis for making generalisations to new circumstances, whether it be into the future, to a new medium, or into an environment in which some medium is more familiar than at present. The aim has been to establish the long-term potential of new media, to aid decisions on what kinds of media to introduce and which variants of them are likely to be most successful.

This paper discusses our approach to the development of the methodology of fundamental studies of demand for new media and its application to studies of requirements for new information media in the home. The studies covered the whole spectrum of information needs, from how to buy a house and what films are showing at the local cinema to whether social services would deliver meals regularly to an elderly disabled relative living alone. They also included information consumed as entertainment.

The Disadvantages of Direct Methods

The alternatives to fundamental studies are direct approaches such as questionnaires asking people whether they would use a medium or field trials with prototype equipment. Questionnaires have many disadvantages as indicators of long term demand for new media.

- They may meet a lack of understanding or experience of the capabilities of new media,

- or a tendency to define communication needs in terms of the media currently used to satisfy them,

- or the "country bus" phenomenon, people saying they would use an attractive sounding service without considering whether they would in practice have occasion to do so, especially if costs are not mentioned. (This effect is said to have bedevilled early studies of demand for new rural transportation services).

- Simple market-research-type questionnaires are unlikely to reveal paradoxical results such as the finding in a fundamental study of opportunities for teleconferencing that on some occasions people can be more persuasive over the telephone than face-to-face[1].

- People will seldom admit to motivations which they consider socially unacceptable (eg laziness) in response to direct questioning, but they are likely to be revealed by fundamental studies.

Field trials also have disadvantages and their results are often difficult to interpret.

- Unless they are very extensive, they may not overcome novelty effects.
- Communications media require an appropriate environment to receive and respond to trialists' communications, whether a high proportion of terminals among the people the trialist would wish to communicate with or a sufficiently rich database, and it is frequently impossible to achieve such conditions on a trial.

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* The views expressed in this paper are those of the author and should not be taken as indicative of the policy of the British Post Office.

- The time required for a new medium to be developed and take is significant, and the decision to go ahead will often have to be taken well before the market is ripe. A field trial may show no demand for a medium at present, but in ten years time consumer sophistication may have increased and the picture may be radically different.

- Field trials are an expensive way of gathering information compared with survey-based methods.

Fundamental studies can avoid these pitfalls and indicate long term market potential by addressing the social and situational determinants of communication needs and the extent to which they define the characteristics of media which are to satisfy them.

The Fundamental Study of Teleconferencing

The first of the fundamental studies of demand for a new medium was carried out by the Communication Studies Group in the early 1970's [1,2]. Its subject was teleconferencing and the extent to which it could substitute for face-to-face meetings. The key element in the methodology was the development of a typology of meetings. The procedure finally adopted to arrive at the classification was the DACOM (Description and Classification of Meetings) technique[1,3]. A set of short phrases describing characteristics of meetings was elicited by a questionnaire survey of managers. A fresh sample of managers were then asked to evaluate the applicability of the descriptors to a meeting in which they had recently participated. The results were factor analysed, and yielded twelve dimensions of meeting function and activity to form a parsimonious framework for the description of meetings. Finally the results were cluster analysed to provide a typology of meetings.

Laboratory experiments were run to investigate whether meetings representative of each of the clusters could be conducted effectively by teleconference, and in both laboratory and field studies users were questioned about their attitudes to teleconferencing systems and the acceptability of the systems for meetings of different kinds. To estimate the size of the potential demand for teleconferencing it was assumed that those kinds of meetings for which teleconferencing and face-to-face interaction produced the same outcomes and where teleconferencing was felt to be as good as face-to-face could be substituted by teleconferencing. The volume of meetings of this kind as a proportion of all meetings was estimated from observational data.

The innovative methodology of the CSG study has been much discussed and criticised[4,5,6]. Its principal shortcoming, acknowledged at the outset by its creators, was its limitation to investigating the effects of the nature of the transmission channel on the success with which the formal objective of a meeting is attained. It did not address the other factors which in practice influence decisions to use a teleconferencing medium rather than travel to a meeting, for example studio and terminal arrangements, the nature of user organisations (including the attractiveness to personnel of travel alternatives to relieve boredom, get out of the office etc), or the support provided to the service[7]. In consequence it could not predict the extent to which teleconferencing media would be likely to substitute for face-to-face meetings, only to indicate the proportion of meetings which could from organisational viewpoint be conducted by teleconference without loss of effectiveness.

Several criticisms have been levelled at the assumptions underlying the method:

- The assumption that people have a choice of media for conducting their meeting may not always be justified; practical or organisational constraints (eg lack of time for travelling) may reduce the number of available alternatives to one.

- The model assumes that teleconferencing media are ubiquitous and familiar, and gives no account of what is likely to happen before that state is reached. Important factors acting when such media are first introduced include the disincentives of entry costs, learning effects, both those favourable to usage (novelty) and unfavourable (inertia), and the effects of a lack of an adequate quorum of users or locations possessing appropriate terminal equipment.

- It also assumes that the number and pattern of meetings remains unchanged following the widespread introduction of new teleconferencing media, although in practice they may allow new kinds of transactions (diversification of this kind represents a further example of learning), change the number of transactions required for a task or even radically alter the task.

- Similarly, it was asssumed that substitution could only take place when the new medium was as good as the old and produced the same results, whereas in practice it may occur when the new medium is manifestly worse in many respects but also has some major advantages (eg the telegraph as compared with messengers or the mail). It could be argued that the conditions for substitution assumed in the study are those for which it is least likely to occur, since the old and familiar will always be preferred to the new and strange, unless the aim of reducing costs for the organisation motivates individuals strongly in their daily actions, an assumption which appears questionable for the majority.

Studies of Information Needs in the Home

Our interest has recently turned towards the demand for telecommunications information services in the home. The technology is now ripe to deliver a wide range of services but there is some uncertainty as to how many customers they would attract and, in particular, as to the demand for one kind of service relative to others[8]. Studies of the demand for services in the residential sector suffer even more acutely from the methodological problems of questionnaires and field trials than do studies of business requirements, so that fundamental methods seemed particularly appropriate. Two complementary studies were commissioned, one from the Centre for Mass Communication Research (CMCR) at the University of Leicester, England and the other from Communications Studies and Planning Ltd (CSP) of London. It was intended that CMCR should present a broad picture of information usage while CS and P explored specific needs in depth.

Several attempts have been made to classify behaviours in which information media usage plays a part and the uses to which the information is put. Some of the typologies are useful aids to understanding the studies of residential information needs and appreciating their results. Emmett[9] summarises the audience needs which broadcasting media satisfy as guidance, surveillance, diversion, reassurance, relaxation, companionship, stimulation, self-esteeem, and pleasure. Only guidance and surveillance imply possible action on the basis of the information received, as opposed to information consumption as an end in itself. The precise nature of the information, the content of the communication, is therefore more important in the satisfaction of these needs than the others. Schramm[10] first noted this distinction, pointing out that in the one case reward is delayed, while in the other it is immediate.

Within the domain of information use where content is important a clear distinction can be drawn between 'browsing', reviewing a range of information on a topic in case anything interesting crops up, and 'directed search', the pursuit of a specific item of information. On a different dimension, Sepstrup[11] distinguishes between 'normal' or habitual media usage and the exceptional usage which arises when normal routines do not yield the information to satisfy an important need in relation to a specific topic. The CMCR study[12], recognising the distinction between habitual and special media usage, specifically sought information on both counts, and encompassed entertainment, browsing and directed search in order to set the context for forecasts of future media usage. The CSP study[13] also recognised the difference between normal information media use and directed search for information on a particular subject over and above habitual media use, and focussed exclusively on the latter. It was argued that the determinants of demand and the nature of the services required to satisfy them are so radically different in the two cases that they can be considered in isolation, and a study of non-habitual usage appeared the more promising vehicle for the development of models to predict usage of new media.

Directed Information Search and the Attributes of Appropriate media

CS and P employed a methodology which was a direct development from that of the earlier teleconferencing studies. Initially an exhaustive list of attributes which would be likely to affect the degree to which an information source was satisfactory on any given occasion was compiled on the basis of pilot surveys and other sources. A stratified sample of 413 people was then interviewed in detail about an occasion in the recent past when they had had a specific information requirement. A technique was evolved which, on the basis of initial questions about interests and recent important events and activities, enabled one of the interviewee's recent information requirements to be chosen at random. The attributes required of the sources of the information for it to be usable, the information media and sources consulted, the order in which they were used, their perceived attributes, and the respondent's satisfaction with the outcome were then explored in detail. The questionnaire data provided the material for a classification of information using transactions; the corpus of transactions was cluster analysed on the basis of the attributes required of information sources in each case[14].

Up to this point the procedure was analogous to that of the DACOM study. It was felt, however, that the information using transaction (IUT), the smallest component of an information requirement which could be defined without reference to specific media, was a more fundamental unit of behaviour than the information using event (IUE), a single occasion on which use is made of a communications medium. It was apparent that although the goal of a transaction is specified in advance the sequence of steps (IUEs) by which it is attained may be flexible, with alternative ways of obtaining information available and often with each IUE depending on the outcome of previous ones. The clustering was therefore performed at the level of transactions rather than individual information using events. This contrasts with the DACOM study where individual meeting, and not the sequence of meetings needed to achieve some organisational goal, was taken as the fundamental unit.

A divisive hierarchical clustering procedure was employed. In this technique the population of transactions is successively subdivided on the basis of the possession or non-possession of an attribute; the attribute chosen at each stage is the one giving the most homogeneous groups after subdivision. The analysis suggested ten categories which between them accounted for a high proportion of information using transactions. Each of the categories possessed a distinctive character endowed by its defining pattern of attributes and confirmed by inspection of the cluster members.

A second questionnaire survey systematically investigated media choice for each of the ten categories of IUT's. Respondents were presented with a description of an IUT typical of one of the categories and asked to describe a similar instance of media use from their own experience over the previous two months. In particular they were asked state what media they had used and whether their interactions with them had been satisfactory. They then replied to a series of questions designed to elucidate their perceptions of the attributes of the media concerned. The questionnaire yielded a database in which the relative frequencies of media choices for each kind of IUT were related to perceived attributes of the alternative media defined on scales common to all of them.

This conjunction allows the effect on demand of a change in the attributes of existing media and the relative frequencies of use of new media to be modelled, providing the new media can be defined in terms of the same attributes as the old ones. An acceptable model of media choice at the individual level has to be probabilistic in form to allow for individual differences and variation in information needs from one occasion to another. CSP assumed that the probability of a medium being chosen is a function of its utility in comparison with those of the competingmedia (for mathematical convenience a multinomial logit function was employed). The utility was in turn taken to be a function of the attributes of the medium and weightings reflecting the importance of each attribute in media choice.

To derive the weightings and calibrate the mathematical model a maximum likelihood technique was used so that media choice probabilities estimated from the model corresponded as closely as possible to those observed in practice. Inspection of the weightings allows the relative importance of the factors in determining choice behaviour to be determined directly, and enables the problems of interpreting subjective assessments of importance to be avoided. If a new medium is defined in terms of its attributes its utility can be calculated, since by definition the attribute weightings are constant for all media. The likelihood of its being chosen in competition with existing media, or some subset or alternative set of media, can then be determined.

Preliminary results of the CSP information media study have provided valuable insights into users' perceptions of existing media and into the factors having the greatest effect on choice. They have also indicated the factors which might a priori have been expected to influence choice but do not do so to a significant extent. Presentation of information in spoken form or alternatively its availability in 'hard copy' markedly favour the use of a medium.

Perceived authoritativeness, accuracy in terms of being up-to-date, familiarity and ease of use and the ability to present graphic materials also enhance the likelihood of it being chosen, but at least within the domain of information using transactions to which the CSP study was confined the marginal cost of a transaction has no significant bearing on choice probabilities.

Improvements on DACOM

The shortcomings of the original DACOM method would have been especially critical to a study of demand for services in the home, and the later study improved on it in several ways. It would be ridiculous to assume that a new information medium could completely replace existing media for all information using transactions it was capable of handling. The authors were careful to stress that such an assumption was only made in the DACOM study in order to estimate the potential of teleconferencing, and not in order to predict actual usage, but it is implicit in the decision to calculate potential that such an estimate could in principle be realised because of the overwhelming cost advantages of teleconferencing over travel. Many factors other than cost enter into the choice of information sources and media, and no single attribute is likely to give a clearcut advantage in all cases to the medium possessing it. The estimation of potential would therefore have been sterile, and it was important to estimate how far new media would in practice substitute for existing ones in competition with them.

A second difference between the two studies also concerns the issue of substitution. Intuition on the basis of laboratory experiment results was the ground for judgements in the DACOM study as to whether substitution would take place; the information media study introduced a more rigorous procedure for weighing the effect of attributes affecting media choice.

There are differences between information requirements on separate occasions and for different purposes and between individuals in the factors affecting media choice and their relative importance. A probabilistic approach to media choice was therefore an essential requirement, and an important property of the model is that it makes no specific assumptions about the conditions in which substitution takes place, merely predicting its extent.

The distinction between the formal success of a meeting, (the extent to which if fulfiled the objectives set for it by the participants' organisations), and the participants' personal preferences has no meaning in the context of the private use of communications services in the home. The same individual has to weigh the value of information from a given source against (say) his dislike of the travel required to consult it. There is no mechanism by which the latter factors can be divorced from the former in the decision process, as may be the case in organisations. This is one of the reasons for the multiplicity of factors for which the model of information media choice has to cater; there is no single 'effectiveness' dimension which predicts use in isolation from other factors.

The procedure for predicting demand for new information media in the home is an improvement on the DACOM technique in one other respect, Although the model is static and not dynamic, it can account for changes in demand with time due to the increasing familiarity of a new medium and other changes in its perceived attributes.

Opportunity and the Context of Media Use

The extent to which opportunities for communication transactions of a given kind actually lead to such transactions taking place depends on the utility of the available media, although the degree of dependance will vary from one type of transaction to another. In an extreme case if all media are unsuitable very few transactions will occur, but if a good new medium is introduced it is likely that its advantages will be exploited to enable many more transactions to take place. This is one reason why models predicting demand for new media solely on the basis of their potential for replacing existing media in transactions of the number of kind taking place at present are unsatisfactory.

Even if a new medium is ideal, however, the frequency with which situations where it is appropriate arise will impose a ceiling on its usage. It follows that it is not sufficient to survey the current use of information sources; the context in which that use takes place and the potential it offers for increased usage were appropriate media to be present must also be established.

In the office the need for meetings arises as a direct function of the operations of the organisation, so that it might be expected that the frequency of meetings would be relatively independant of the utility of the available media. It is therefore acceptable as a first approximation to estimate the opportunities for teleconferencing from the number of face-to-face meetings taking place, as was done in the DACOM study, especially since it can be assumed that face-to-face communication is ideal in these circumstances. Estimates of the opportunites for the use of new information media in the home based on current use of existing media are likely to be far less reliable, since the familiarity, accessibility and other properties of information media play an important role in determining their use, especially where the gratification obtained from media use itself is its object rather than information for future exploitation. Information media consumption in the home must therefore be placed in its sociological and situational context, and the factors linking context-determined opportunities for media usage with people's perceptions of their information needs and actual usage elucidated.

An emphasis on the social context of communication is characteristic of the work of the Leicester University Centre for Mass Communication Research. Peggy Gray of CMCR is currently completing a study of present information source and media usage and its relationship to the social context in which it takes place and the availability of information sources[12]. How do perceived needs and actual media usage relate to what people do at work and in their spare time, and to the kind of family and social lives they lead? The survey, which was conducted in a varied range of communities in two large English towns, investigated both habitual media usage and how people satisfied important and exceptional information requirements. Within each community data was collected on the lifestyles of various groups their perceived information needs, the availability of existing media, their limitations and barriers to their use.

The preliminary results indicate that information needs and the way in which they are satisfied through institutional channels, media usage and interpersonal communication vary according to social class, education level, age and interactions of these factors. Where people obtain their information reflects other aspects of their lives. For example, one of the towns surveyed had a markedly higher social club membership than the other, and its inhabitants reported a significantly greater reliance on personal contacts for information. Similarly people who habitually use libraries as sources of books for entertainment are also more likely to obtain their information there as well. Although high overall levels of satisfaction with existing information sources were reported, certain kinds of information need in some geographical areas were not well served by specialist agencies.

In general the survey revealed the importance of geographical variations over quite short distances a very high proportion of information needs are for information of relevance only within a small geographical area (eg the availability of housing in a particular town or the programmes at its cinemas), the extent to which they are satisfied varies from one part of town to another, and the sources used for preference tend to be of a local nature. It was also apparent how important accessibility and ease of use are in determining what information source will be used. People living close to town centre information sources use them freely, whereas those who have to make a difficult journey from an outlying suburb will do so less readily. Major differences in source usage patterns between areas can often be ascribed solely to differences in the information sources available. In one town, for example, a considerable proportion of interviewees obtained consumer information from a convenient and well-publicised consumer advice centre, whereas in the other no such facility was available.

The Value of Fundamental Studies

Are the results of the fundamental studies of information needs in the home of practical value? Is Vallee's criticism[5] that social studies have a long way to go before they can provide useful feedback to the designers of telecommunications systems still valid? The CSP model of demand for information services in the home produces more readily applicable results than did on the DACOM study, but it still suffers from two major shortcomings as a predictive device. It assumes that the pattern of media choice has achieved a steady equilibrium state after the introduction of a new medium, and that after its introduction the volume and pattern of information using transactions remain unchanged, ie no new traffic is generated.

Equilibrium may never be attained after introduction of a new medium before another one is introduced, or may only be reached after a very long period. (How long did it take for information media choice to restabilise after the invention of print?). The model provides no information about the process by which equilibrium is attained or the time taken, information which is vital to commercial organisations with investments to recoup. It is possible, too, to envisage processes by which the conditions under which a new medium is introduced affect its eventual form and market share.

Similarly the assumption that no new traffic is generated is a major handicap to the model. The survey data showed a high degree of satisfaction with existing media as sources of information. This implies that people think of their information needs in terms of what they know to be available. If the old media are satisfactory it is unlikely that a new one will readily take over a significant proportion of their established traffic, but it may cause people to realise that they could use other kinds of information which they had not considered before. There is some evidence from field studies of teleconferencing[15] and electronic mail/computer conferencing[16] that a significant proportion of the traffic on a new medium may be new rather than taken over from existing media. Studies of the sociological and situational context of media usage and the factors influencing the perception of information needs, such as the CMCR study, could help in estimating the traffic generating potential of new media, but the methodology for incorporating their results in quantitative models is not yet fully developed.

The results of fundamental studies can nevertheless be of real help to system designers and business planners. The DACOM study indicated the potential of audio teleconferencing systems relative to the then more highly regarded video alternatives. The CSP study and model have already given indications of the characteristics successful information media are likely to possess, and the model is very convenient for making comparisons between variants of a medium. The variants are defined in terms of their attributes, and the 'market share' of each in turn in competition with other media can be computed to give a clear indication of which is likely to be most successful. The calculated absolute values of market share may not be trustworthy but the discrepancies between the model and reality are not likely to bias estimates of the market shares of the variants in different ways, so that the results of comparisons between them will be more reliable.

Fundamental studies cannot of course remove the uncertainty surrounding the launch of a new medium, but when added to other sources of evidence they can boost confidence in the decision to go ahead. They are a vital weapon in the armoury of techniques for identifying requirements for new media and services and ensuring that they are offered in a form appropriate for their intended function. As such as they are particularly important in guiding decisions as to how resources for long term developments should be apportioned, and they should supercede field trials for the testing and comparison of basic concepts, a role in which field trials with their high associated costs are grossly inefficient. Fundamental studies have proved to be a more convenient way of finding out how to provide the information for our hypothetical grandmother.

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GENERATING PUBLIC OPINION DATA VIA INTERACTIVE MEDIA

Dr. Barry M. Orton
Assistant Professor of Telecommunications
University of Wisconsin-Extension
Madison, Wisconsin

Introduction

The 1970's have seen experimentation with a number of interactive media-based techniques that combine the generation of public opinion data with a focused information campaign. Increasingly but not necessarily computer - related, these systems are largely designed to elicit and measure "informed" opinions of citizens who "vote" interactively after exposure to related materials in a process that attempts to combine persuasion and measurement. Because participants are self-selected, these techniques can not be considered as sampling, but rather must be examined as methods for interactive communication with large segments of the media audience. Termed "Media Balloting" in this paper, these techniques range from primitive hand-tabulated newspaper coupons to computerized audience response mechanisms such as the Warner-Amex Qube two - way cable television-based system in operation in Columbus, Ohio and under construction in Houston, Cincinnati, and Pittsburgh. Intermediate techniques include teleconferencing networks and computerized conferencing systems which have a specific opinion research component.

Evolution of Media Balloting Systems

The earliest prototypes of Media Balloting were newspaper and magazine reader surveys and radio "listening groups." The reader poll, long a staple of editorial and feature pages, fell into considerable disfavor after the 1936 Literary Digest fiasco wherein Literary Digest readers overwhelmingly picked Alf Landon to beat Roosevelt for the Presidency. Subsequent adoption of professional standards for scientific sampling in opinion research further reduced the use of the reader poll as an opinion measurement device. While many newspapers have recently revived the technique as a means of generating editorial copy and reader "involvement," the results are no longer advanced as representative of the greater population.

The radio listening group concept also has a history of cyclical use and subsequent disenchantment. Based on focused group discussion of radio programs and subsequent participant balloting, the process was first tried on a mass basis in 1927 by the British Broadcasting Corporation,[1] and has since been used extensively by UNESCO as a community development tool in developing nations. In the United States, many radio listening groups were organized in relation to several separate national and regional projects. The League of Women Voters produced the earliest, titled "Voters Service," which was carried weekly from 1928 to 1934 by the NBC network. [2] "America's Town Meeting of the Air" was the longest-running listening group series, with broadcasts spanning over twenty years from its initiation in 1935 from New York's Town Hall. In addition, several other regional and national public-affairs series were sponsored by the federal government during the 1930's as part of its efforts to engineer a recovery from the depression. By the middle of the 1940's, however, most of these radio listening group efforts had collapsed, due both to cutbacks in funding and to war-related pressures on broadcasters to reserve more airtime for paper-hungry advertisers.

The major exception to this pattern was a Ford Foundation-funded series set in twelve cities in the mid-1950's. Sponsored by Ford's Fund for Adult Education, the "Test Cities Project" sought to establish permanent listening group operations focusing on civic issues, with provisions for interactive audience response in the form of call-in questions and formal issue ballots. The most successful of these efforts was the San Bernadino, California "Community Education Project," which combined group discussion, call-in questions, and newspaper coupon ballots for individuals not attending listening group sessions. The San Bernadino case later became the model for the first interactive television "viewing group" project when Eugene Johnson, its director, was invited to St. Louis to direct Washington University's "Metroplex Assembly." [3] The series ran from 1958 through 1963, and established a model for the use of interactive television as a tool for community education and opinion balloting.

Interactive Media Balloting In Regional Planning

Much of the recent use of interactive media-based opinion balloting has focused on public participation in regional planning and development. Since 1973, over twenty major projects have sought to elicit citizen involvement in the regional planning process by combining an information campaign with opportunities for interactive feedback to decision makers, usually in the form of Media Ballots. Efforts such as "Choices for '76" (New York, 1973), "Alternatives for Washington" (State of Washington, 1974), "Tell Tucson Where To Go" (1973), "Goals for Corpus Christi" (Texas,1975) and "North Carolina Tomorrow" (1977) offered media audiences the opportunity to respond to regional development alternatives by completing newspaper coupon or special insert ballot forms.[4] Additionally, the discussion group format was used by many of these projects, and several published paperback books based on the ballot results.

Many of the more recent Media Balloting efforts have utilized computer-compatible ballot formats to facilitate rapid tabulation and analysis. Early cases simply used optically-readable computer cards as ballots, while several later projects experimented with distributing individualized templates which allowed individually punched data cards to be directly machine-tabulated. Each participant was assigned a separate data entry file, allowing iteration of the ballot process to generate a cumulative bank of data on each "voter's" preferences and demographic characteristics. Federally-financed demonstrations of the system were carried out in the Roanoke, Virginia region ("People Planning," 1974) and in four sites in the state of Washington ("Community Issues Dialog," 1977).[5]

A variety of ballot distribution and collection mechanisms have been used by these recent projects. While most relied on newspapers to publish the ballots in either coupon or special insert format, several experimented with direct mail distribution. One case sent ballots home with school children, and one included ballot forms with utility bills. Return mail was the most frequently used ballot collection device, with about a third of the cases studied providing postpaid envelopes. A few projects collected completed ballot forms in person, and two provided "ballot boxes" in public places such as libraries and schools. Two Media Ballots sponsored by the Gallup Organization, the 1949 "Experiment in Democracy" (New Brunswick, N.J.), and the 1970 "Public Opinion Referendum" (Ohio), utilized specially "deputized" newsboys and Boy Scouts to distribute and collect ballots and to guard against ballot fraud.[6] The more recent Altanta "Futuretalk" case used special telephone lines to viewing groups to enable organizers to tabulate and televise results within three hours after the original program aired.

Empirical data on levels of citizen participation in Media Balloting experiments was mixed, with the bulk of cases reporting response rates in the .1% to 1% range, where response was measured as a proportion of total ballots distributed. In seven cases response was somewhat higher, with ballot return rates between 2% and 5% of those distributed. With only two exceptions, the projects with better response were those that provided return postage and/or used special newspaper inserts rather than coupon ballots. The highest response, nearly 20%, was generated in the 1977 "Community Issues Dialog" case where ballot cards were directly mailed to each household. Excluding this unusual case, the data suggest that 5% response is an approximate ceiling for mass participation in interactive Media Balloting.

In cases where the Media Balloting was iterated, response levels fell off quite dramatically. In remarkably similar patterns between cases, the most drastic response decline came between the second the third iteration, possibly due to a wearing off of the novelty of the process. In any case, by the fifth iteration participation dropped to insignificant levels, often forcing project sponsors to cancel remaining ballots. This pattern was repeated both in cases where iterations were scheduled weekly, and in those conducted on a monthly basis.

Demographic data on participants was available for eight Media Balloting cases. Moderate skews towards higher levels of income, education, and age were most common, with two projects reporting overrepresentation of males and one of females. When coincidental scientific sample surveys were compared to Media Ballot results, however, the results were largely similar after controlling for demographic differences. This data partially undercuts arguments that the response bias from self-selected participants makes Media Balloting results unrepresentative of the public.

Cost-effectiveness data varied quite widely, with several cases proving extremely costly in terms of the number of ballots returned. The cost per response ranged from a low of about 35¢ in two cases to a high of nearly $200 per ballot for the Alaska project. Overall, however, the cost of a returned ballot form was considerably lower, with the mean

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for the case population falling slightly below $32 per response. This figure compares favorably to standard costs for completed survey interviews.[7] Another generally applicable cost-effectiveness measure, cost per thousand viewers reached (CPM), also showed wide variation between cases, with six projects having values well over $1000; the Alaska case CPM was over $5000. On the other hand, three efforts had CPM's below $20, an extraordinarily low value for mass multimedia campaigns.[8] The comparability of this cost-effectiveness data, however, is limited due to wide programmatic variations between cases. Evidence about the persuasive effectiveness of the information campaign elements was available for only two cases, "Choices for '76" (New York, 1973) and "Futuretalk" (Atlanta, 1978). The earlier project, sponsored by the Regional Plan Association, found some limited short-term opinion change as a consequence of participation in the process.[9] Evaluation of the "Futuretalk" case produced evidence of knowledge impacts, but no significant opinion shifts.[10]

Data on the policy-related impacts of the Media Balloting process was limited to sponsors assessments of projects' effectiveness. In general, the sponsors rated policy impacts the least successful component of the process. On the other hand, some evidence of clear success in this area was found for about a third of the cases studied.

Telecommunication-Based Balloting Systems

A second significant group of interactive opinion-generation techniques are electronic and telecommunication-based systems. Still primarily in the developmental stage, these processes utilize machine-aided or on-line ballot mechanisms to tabulate and display respondents' opinions very shortly after they are registered. While most of these systems were designed for a limited number of participants, (less than 100 in most cases) several allow responses by significantly larger groups.

One of the earliest prototypes in this category was Umpleby's "PLATO" system,[11] (1970) which simply allowed instant tabulation of binary responses from a small number of terminals. The system was also severely limited in terms of the geographic dispersion capability of the response terminals, although telephone lines could be used with special couplings.

Etzioni's 1972 "MINERVA" system added voting capability to home telephones for conference calls of up to 30 people, with a provision for a participant to electronically "request the floor". Called an "electronic town hall," MINERVA was partially demonstrated but never applied to real decision situations. Two-way cable TV or live TV and telephone-based response was envisioned for groups larger than about 300 people.[12]

Several other telephone-related opinion research systems have been tested, with the most common based on devices which simply count the volume of calls coming in on a single line. Local television news programs have used these mechanisms as an audience participation feature, and offer two numbers for viewers to call to register a "yes" or a "no." A more sophisticated system, tested in San Jose, California in 197? under the name of "Televote," had participants use the data generation capacity of the home telephone's dialing mechanism to relay individual opinions. A central receiving system tabulated voters' preferences as coded from dialed answers to a set of previously distributed questions about local school issues. A computer program checked "registration" by previously assigned code number and allowed voters to change their opinions before a closing deadline.[13]

Another telephone-based system, also called "Televote," but technically simpler, was used as part of the 1978 Hawaii State Constitutional Convention. The process involved a mailed ballot which invited phoned responses. Calls were answered by University of Hawaii students who entered opinion data directly on computer terminals, with tabulations made available to Constitutional Convention delegates and the press.[14]

Telephone interviews have, of course, become a standard opinion research technique in the last decade, with computer-generated dialing, question prompting, and on-line recording now common procedures. Computerized conferencing systems such as the Electronic Information Exchange System (EIES),[15] funded by the National Science Foundation, take the technology one step further and allow on-line conferencing combined with message storage and distribution. Hiltz, one of the originators of the EIES network, recently suggested its use to probe the in-depth opinions of specially selected sample panels, each member having access to a terminal.[16] Hiltz sees these panels as the electronic equivalent of mail panels or of the samples regularly "metered" to record their television viewing patterns.

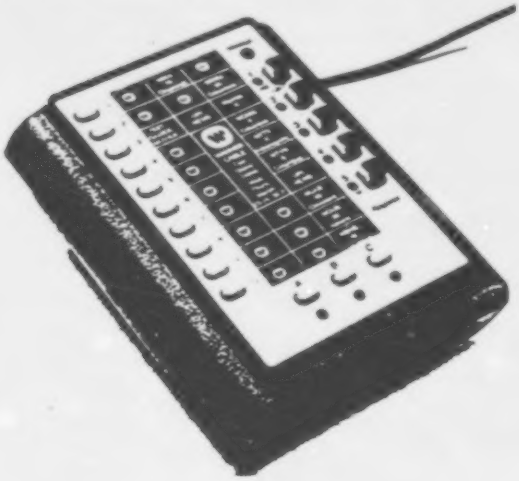
Another computer-related device for generating panel data for opinion research is the "Consensor" which is a patented (Applied Futures, Inc., Greenwich, Conn.) mechanism for on-line real time visual display of panel opinions. Designed initially as an aid to corporate planning and decision-making, the system has recently been used by the State of Alaska as the core of a telephone-based Media Balloting process focusing on capital budget options.[17] The Consensor uses microprocessor technology to allow up to 100 participants to register opinions (11 possible selections for each question) and to qualify their opinions in terms of confidence, expertise, or any other criterion (up to 5 options). All "voting" is done anonymously, and tabulations are shown to all in histogram form on a display monitor. Weighted means are also shown, as are the average group weights. Corporations such as Chase Manhattan Bank, Xerox, AT&T, and Du Pont have used the system for strategic planning, as have the U.S. State and Defense Departments. At present, the system costs about $15,000 for a 17-terminal unit, with additional terminals going for about $200. The basic unit can be leased for about $500 per day or $1500 for one month.

CONSENSOR TERMINAL

Modern two-way cable television technology provides another vehicle for interactively generating data on audience opinions. As early as 1971, a RAND study speculated about the possibility of an "instant referendum" for local government via cable TV, focusing on cable's ability to televise local meetings and offer citizens an interactive "vote" via a projected home terminal device.[18] By 1977, the first operational two-way cable system was "energized" in Columbus, Ohio, and marketed by Warner-Amex Communications under the trademark of "Qube." Each subscribing household uses a hand calculator-sized console to register "votes," buy special programming, play audience-participation games (such as an electronic local "Gong Show"), or order products from the televised gift catalog. Tabulation is done by computer at the headend within six seconds, and appears on home screens simultaneously.

While the bulk of the Qube system's two-way uses have been in the entertainment area, its opinion research applications have generated significant local and national interest, as well as considerable controversy. Columbus viewers have been given an opportunity to register preferences on topics as diverse as local planning commission issues, proposed U.S. Food and Drug Administration labeling policies, and President Carter's July 1979 energy message. The latter event, which was televised nationally on NBC's "Prime Time Sunday" program, asked Qube viewers to react to specifics in the speech in terms of their confidence in the President and his policies. Some 8135 households in the Columbus area participated, representing about 32,500 people.[19]

A strong protest of NBC's presentation of the Qube poll was registered by Albert Cantril, president of the National Council on Public Polls, an association of professional public opinion research organizations. Cantril argued that NBC conveyed "the impression that there were national implications" to the Qube results, despite the self-selected and geographically limited sample.[20] As two-way cable TV proliferates, opinion researchers can be expected to continue to raise this fundamental issue.



QUBE TERMINAL

In spite of these objections to Qube's use in polling, the system has begun to be extensively utilized by market research firms as a testbed for commercials and proposed products. A Columbus television station has even used Qube to test audience reaction to newscasters under consideration for "anchor" positions. Direct product marketing via Qube has also served to test the audience's willingness to accept new services such as electronic funds transfer. New optical fiber technology promises to make such interactive cable systems much more common in the near future.

Issues and Problems

In spite of the rapid growth of the use of interactive opinion research techniques, several critical issues remain unresolved. The first, response bias due to self-selected participants, promises to remain with us for some time to come, despite evidence from coincidental sample surveys that media balloting results closely match preferences of the wider population. As interactive opinion research methods become better defined and more widely used, it can be expected that correction factors will be built into tabulation programs to account for differences along these lines. Arguments that the information campaign elements cause additional bias are far harder to counter, although response bias stemming from the wording of survey questions has been a continual problem in opinion research.

A more serious problem concerns the low rate of response to many of these research methods. Can a project which yields a response of less than .1% of those eligible to participate be truly termed "interactive?" While data from recent regional planning-related Media Balloting projects indicate responses of up to 20% are possible, the range from 1% to 5% was more typical, with many cases falling far below the 1% level. In most of the multi-ballot cases, even modest response rates fell off drastically after the first two iterations. This evidence indicates serious potential difficulties if these techniques become more universally adopted.

On the other hand, audience apathy towards these processes is certainly understandable in light of the potential dangers inherent in their use. There is legitimate concern, for example, about the protection of individual privacy rights when computerized systems with memory capability are used for recording ballots. The Qube cable TV system has the capacity to bill individual households for programs and products that were ordered from the home terminal. It could just as easily be programmed to print out all who ballot in a particular pattern or watch certain programs.

Related to the privacy question is the issue of control of the information campaign component and the wording of the ballot itself. Either can easily be designed in ways that can greatly determine the outcome of the vote. If the technique is to gain popular legitimacy, some method of assuring fairness and balance must be built into the structure of the process itself so that manipulation by its sponsors is not possible.

Another factor inhibiting participation in interactive opinion balloting is its lack of statutory authority. Unlike the legal electoral processes of initiative, recall, and referendum, the results of nonbinding ballots can easily be ignored by public officials, increasing the likelihood of citizen apathy and mistrust towards the process.

A more theoretical objection to interactive media-based opinion polling was raised by Laudon in his 1977 study of a proposed teleconferencing and balloting system for the League of Women Voters. Laudon argued that such mechanisms diminish the individual's political power by strengthening vertical communication linkages between citizens and policymakers at the expense of critical horizontal linkages such as neighborhood, church, and voluntary associations.

> The basic notion...is that individual citizens will confront and decide the issues of the day in their isolated homes in front of some broadcast device. Yet this assumption is highly atomistic and contrary to most research, which shows that political opinions are formed in the context of community subgroups of which citizens are members...If the locus of political attitude formation shifts from subgroup settings to the isolation booths of millions of homes, the protective functions of subgroups will be lost. Bereft of the advice, political savvy, and information provided by peers in group settings, the citizen becomes more mobilizable, more accessible, than at present.[21]

When participants in electronic balloting processes are allowed only a minute or so to vote on each question, as they are in some systems, Laudon's objections take on significant weight.

A final issue worthy of mention here regards evaluation. Traditional measures of information campaign effectiveness such as response rate, cost-effectiveness, attitude changes, and the like can only partially guage the success of interactive opinion projects. When possible, coincidental sample surveys should be taken to supplement response from ballot participants and to test how well participant data represented the larger population. Evaluation criteria for the policy-related impacts of the process should be developed whenever possible. Similarly, clearcut goals and levels of achievement for discussion group elements are needed for any meaningful evaluation of this component.

Prospects for the Future

In the near-term future of interactive opinion research, proliferation of most of the varieties of the techniques described here is likely. Interest in the use of TV and newspaper Media Balloting for generating public participation in the planning and development process has continued among planners, architects, and futurists, with several major projects scheduled for 1980.[22] Telephone-related systems are moving towards total on-line prompting, data recording, tabulation, and display. The use of Touch-Tone generated signals to send data to remote computers from home telephone sets has similarly increased dramatically in recent years, making opinion registration via machine-to-machine communication nearly universally available. Telephone-compatible peripheral computer hardware has also become commonplace, multiplying the on-line possibilities.

The most visible interactive opinion system in the next few years will be two-way cable television. Based on the early success of Warner-Amex's Columbus Qube operation, it is safe to predict that an entire new interactive opinion research testbed will soon be within easy reach of most researchers. One can envision research timesharing of cable audience panels on as regular a basis as advertisers buy broadcast time.

The recent rapid growth of the microprocessor and home/consumer "personal" computer markets make the longer-range future of interactive opinion research even more exciting. When combined with the storage and playback capabilities of most consumer-level videocassette recorders, these home systems have the capacity for an entire spectrum of teleconferencing and interactive activities currently available only to participants in formal computer networks. These possibilities include mass participation in Delphi processes, computerized conferencing, and on-line teleconferences, continuing education courses, and interactive opinion panels.

FOOTNOTES

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USE OF TELE-CONFERENCING IN ASSESSING NEEDS OF SCHOOL-AGE PARENTS

Sandra J. Garl
Graduate Student
Adult and Continuing Education
Washington State University
Pullman, Washington

While there have been many curricula developed to educate and give support to the school-age parent, many of the problems and concerns related to pregnancy and parenthood are scantily approached. A reason these problems are not addressed is due to the inadequate information available about the needs and concerns of the school-age parent.

This paper will address the use of tele-conference as a survey method to arrive at the needs and concerns of the school-age parent. The reason for choosing tele-conference as a survey method, the process used, some advantages and limitations and possible applications for future use in adult education will be discussed.

Why Use Tele-Conference?

The major source of information concerning needs of the school-age parents were the school-age parents themselves, however, because of the particular characteristics of this group, most traditional needs assessment techniques are inadequate. Teenage parents often feel out of the main stream of their peers and are often reluctant to share their concerns and problems freely. In order to assess areas of concern to the school-age parent it appeared necessary to interact with them· have them interact with one another; and develop an atmosphere in which they feel comfortable to discuss their needs and concerns. Goldman stated that "interaction between group members stimulates new ideas."[2] This supported the idea that group interaction would give participants a chance to react to various ideas, concerns, and feelings, and that as a result more information would surface than during individual interviews. Ingalls agrees with Goldman and goes on to point out that "assessing learning needs in small groups in which the members help one another to clarify thier individual needs and become resources for others' learning which can be a valuable and satisfying experience."[4] Knowles also outlined some advantages and disadvantages to group interviews:[5]

1) reveals feelings, causes, and possible solutions of problems as well as facts.
2) affords maximum opportunities for free expression of opinion and suggestions.
3) permits synthesis of different viewpoints.
4) promotes general understanding and agreement

disadvantages:

1) getting individuals to participate may be difficult.
2) results may be hard to quantify.

Research also showed that most teenage pregnancies cause interrupted education for both the boy and girl resulting in low reading and writing skills. Therefore a written questionnaire may be difficult if not impossible for them. Further a written survey could result in answers which are inadequate and/or unreliable. With this audience, a form of verbal communication seemed to be an effective way to produce adequate information and clear ideas. With verbal contact the researcher can clarify probe and paraphrase answers until satisfied with the data.

Gordon also suggested some advantages to verbal interviewing:[3]

1) Provides more opportunity to motivate respondents to supply accurate and complete information immediately.
2) Provides opportunity to guide respondents in interpretation of questions.
3) Allows greater control over interview situations.
4) Allows greater flexibility in questioning respondents.
5) Provides greater opportunity to evaluate validity of information by observing respondents' attitude toward supplying information.

Time factor and cost were important considerations for using the telephone. Face-to-face interviews would take more travel time, and the cost of travel, lodging and food would greatly exceed that of a phone call.

According to Dillman, verbal interviews are quicker than written surveys. The verbal survey can be completed (taken, charted, and analyzed) in six hours to two weeks depending

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on the audience size and topic. Mail surveys on the other hand take much more time; up to eight weeks or more.[1]

An important consideration in any type of interview, characteristics of the interviewer like dress, race, sex, and social class can affect the way in which participants react and respond.[3] Those characteristics of the interviewer that different from those of the interviewees, could bias the answers. By using the telephone, only verbal expressions are used, and most of the biasing factors are elminated.

In this particular survey however, the interviewer visited each group that was to be surveyed. The interviewer felt it was necessary with this audience, to build a trust and short term relationship with the interviewees. These girls often feel "looked at", "picked on" or "put down" and do not want to be treated "differently" Therefore, in order to receive adequate clear, and accurate information, the interviewer felt she needed to meet with the girls face-to-face briefly. However, by using the telephone for the actual survey, the interviewees were not affected by the responses and reactions of the interviewer to their comments. Therefore the interviewer feels the survey was less biased than a face-to-face survey, however a little more than if done without any face-to-face contact.

Process of Tele-Conference Call

Pre-Survey Procedures

The process of this survey method, included contacting the groups directors/teachers by letter and telephone; visiting each group face-to-face; sending out an interview guide; setting up the calls; and the actual survey calls.

To set up the survey, letters were sent to all the vocational school-age parent curricula in Washington. Additional neames of people working with groups of school-age parents were received from Dr. Martha Lamberts, Washington State University Cooperative Extension Human Development Specialist. The letters sent to the director/teachers introduces the interviewer, explained the purpose of the study, and informed them that they would be contacted by phone about participation. A call was made within a week to explain the survey and the process for collecting the data in more detail. If the director/teacher was willing to participate, a date was set for the interviewer to meet with the possible participants and director/teacher face-to-face.

The purpose of the visits was to allow participants to become familiar with the interviewer; to build a trust between the interviewer and the participants; to let them know she was interested in them and wanted to help them. It was also a chance to explain the purpose of the survey, the procedures, and what would be done with the results. The interviewer did not ask for any information about needs at this time. The visit was simply to meet the participants and get a feel for their interests, and general concerns. If tele-conference phones were more readily available, this contact could be done by phone. However, with this particular audience and the inaccessiblity of the amplified phone system in most areas, the interviewer felt that face-to-face contact at this point was important.

In addition to getting to know the participants during this visit, the interviewer was able to talk with the curriculum director/teacher to get an idea about how to approach the group. Information about their background, personality, interests, and other related aspects of the group helped the writer appoach the group during the survey.

The director/teachers' role during the survey was also discussed at this time. Because the interviewer was not physically in the room with the participants, she could not see the expressions on the faces, the attention, or gestures of the participants. The director/teacher was instructed to aid the participants in verbalizing all their ideas and feelings. Also, if they did not understand a question or comment, the director/teacher was asked to paraphrase or probe to elicite an answer. In short, the director/teacher was asked to facilitate or mediate.

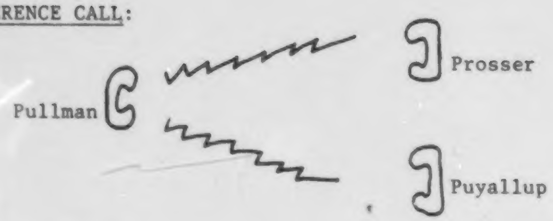
Setting up the Call

There are various ways in which a tele-conference call can be made. (A graphic explanation of each is on the next page.)

The interviewer used a group to group method in all but one situation, which she used the combination method. Each group was assembled around an amplified phone in which all could hear and use for responses. In onel locality an amplified phone was not available, so each participant used a regular desk phone. The writer was in Pullman using an amplified phone so the survey could be recoreded for analysis and transcription later.

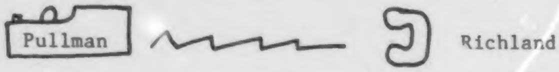
Trying to find a tele-conference site for each group was difficult. Sending amplified

1. CONFERENCE CALL:


Prosser
Pullman
Puyallup

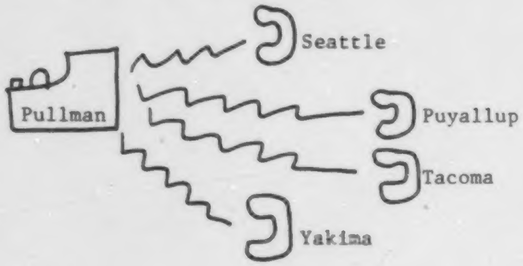
One location
makes a call.

2. AMPLIFIED TELEPHONE CALL:


Pullman
Richland

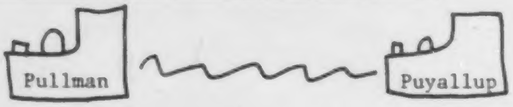
One location receives
the call.

3. AMPLIFIED/STANDARD CONFERENCE CALL:


Seattle
Pullman
Puyallup
Tacoma
Yakima

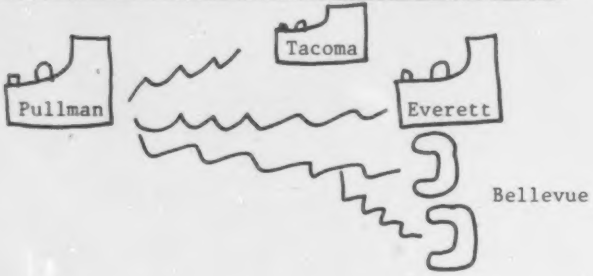
One or more groups
at various locations
can talk.

4. GROUP TO GROUP AMPLIFIED CONFERENCE CALL:


Pullman
Puyallup

One or more groups
at locations can talk.

5. COMBINED GROUP TO GROUP AND STANDARD CONFERENCE CALL:


Tacoma
Pullman
Everett
Bellevue

phones to the groups was a possiblity, but the correct phone jacks were not available at the sites. After many calls and arrangements, sites were found for all, but one group (which used desk phones). Each group was required to travel to the assigned phone site to conduct the survey. Sites used were County Extension Offices, telephone company offices, Community Colleges, and newspaper offices.

After finding phone sites for each group, an interview guide was developed and sent to each participant a week prior to the survey call. The guide was divided into ten areas of concern. Under each area the interviewer developed specific questions in order to gain insights about perceived problems and needs for information.

Along with the interview guide, a set of instructions and an evaluation form for the survey method was sent. The instructions included time, date, and place of the survey call. The participatns were asked to look over the questions and categories to get a feel for the interview topics. The instructions suggested that the participants within each group get together and discuss the categories and questions so they would be prepared with some answers and/or ideas of what they wanted to say.

The day before the actual survey the interviewer called each group and phone site to make sure everything was all right. Any last minute questions or comments were made at this time. A state controlled area network (SCAN) operator in Olympia had to be contacted the day before the survey also. She needed the numbers of all the parties to be connected, and the time of day scheduled for the tele-conference.

On the day of the survey, the operator in Olympia first called the interviewer in Pullman, and then each group was called and connected with the interviewer. After all were connected the survey began.

Actual Call

Each group was given a chance to identify themselves and introduce each participant. The survey proceeded to cover each of the ten categories in depth. Each group was given time to speak to one area of concern at a time. The specific questions sent out prior to this call were not asked directly, since they were only a guide to help the participants prepare for the discussion. Each group was asked to discuss problems and needs for information regarding teh area of concern being discussed.

If a questions was unanswered or ideas were unclear at the finish of the groups' discussion, the interviewer would ask it at that time. All the groups spoke to one area of concern before moving on to the next. There was some interaction between the groups in the form of questions or comments about the ideas and concerns being voiced. These additional questions and comments helped bring out alot of additional information.

After the survey was completed the participants were asked to fill out the evaluation form sent with the questionnaire. This evaluation was concerning the use of the tele-conferencing as a survey method and also an opportunity to write additional ideas and concerns not able to express during the survey. If they were interested in the results of the survey they were asked to send their name and an address to the interviewer.

After the survey the tape recording of the sessions were transcribed for analysis.

Advantages and Limitations

The use of tele-conferencing method was unique in surveying groups. There are many adbantages and limitations as revealed with this study. However, the particular audience and topic could determine many of the advantages and limitations.

This tele-conference survey and previous discussion about group interaction has proven surveys in groups a benificial method of revealing more information and data for use in various manners. When using a face-to-face approach the group size is variable, but only participants in that town or area can be used. By using tele-conference groups from various size towns, backgrounds, organizations, etc. could be brought together at the same time. This can help bring out differences and/or similarities quicker and possibly more clearly.

The size of the groups are limited to ten to fifteen per amplified phone and a maximum of five sites connected at one time, but woul reach 50-75 participants at one time. Within this study, the survey calls with the larger groups took longer. The more people the more information and more factors have to be considered. In this study however, any information mentioned, whether stated once or ten times, was used. In a survey that deals with the quantity of responses, the more people the better, but chances of similar answers could be harder to receive.

Also the length of time may be difficult to limit with this type of survey method. The more people in the survey, the longer it will take. The questions or topics for discussion need to be clear and concise. Also the researcher and mediator had to be skilled in keeping the participants within the limits of the survey. It is very easy for the participants to wonder off, especially when interaction between the groups arise.

In this study, the interviewer found that three to four groups of five to eight participants was the best for interaction and could be handled effectively. This proved to be a workable size to gather data that is concise, clear, and useable. It was much easier to keep this size group on track of the topic under survey.

Length of time of the survey is important to consider also. When a survey goes much longer than an hour to hour and a half the attention of the participants is lost. Also as a researcher doing more than one group survey, they may get tedious.

Pre-planning and pre-testing is important prior to the actual survey and can help to guide the length of the survey. In the pretest the questionning format, and size of groups should be tested. This will reveal if better mediation skills are needed, if the scope of the survey is adequate for tele-conference, if the topic can be covered in adeqate time, and many other possible unexpected problems. The pre-test done for this particular survey revealed the need for adequate preparation of the facilitator at all sites and re-organization of topic questions.

A serious limitation for this groups of participants in this particular survey was the accessiblity of phone sites. Each of the groups were required to travel to an unfamiliar setting for the survey itself. Because these girls being teenagers, pregnant, and/or mothers they feel self concious about themselves and their life situation. It is often difficult for them to talk about their situations, problems, and successes. Having to go to an unfamiliar setting could have had an affect on the data received. They could have felt conspicuous and uncomfortable in an unfamiliar setting. Therefore with this particular audience the data received could be a little more biased or less actual data was received because of the sites available. This could also affect possible participation, if they are required to travel to an unfamiliar setting or site a distance away from their home or business. This would not be a limitation for all audiences, but should be considered when using tele-conference in this way.

For the above reasons and possibly many others the audience and topic determine the advantages and limitations of using tele-conference as a survey method.

Possible Future Applications

As for future use of this method, as a researcher using this method can see is used widely for surveying ideas, opinions, feelings, attitudes, personal needs, and very objective type of information. Again extensive organization and pre-preparation is necessary, but the results are instant. The use of this method of surveying can help give reasons for particular answers to help the researcher understand an answer better and put it to better use in arriving at his/her conclusions and recommendations.

Participants may be more willing to be surveyed if done by telephone, expecially within a group of familiar people. Also the interest in what others: ideas are could encourage more participation. It coudl work negatively, also but from my experience with this study it was a positive force.

This study is viewed as a start in more extensive trials of surveying various types of groups from young to old, rural and urban, in an unlimited objective type surveys. By the use of tele-conference survey, the researcher is able to achieve more insight into the person and the information and hopefully receive better information.

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A FUNCTIONAL ANALYSIS OF TELECONFERENCING

Jacob J. Wakshlag
Department of Telecommunications
Indiana University
Bloomington, Indiana

Mediated conferencing systems offer a service. The service provides the ability for people to interact simultaneously regardless of the geographic distance between them. It is presently possible for the interaction to occur over audio and video channels simultaneously or either channel alone. Audioconferencing and teleconferencing (audio-video) allow individuals to interact in real time. Most applications of video teleconferencing have been applied to human-computer interaction.

Compared to teleconferencing, face-to-face communication is constrained by the fact that transportation is required so that the participants be physically proximate (effort). Relative to face-to-face communication, audioconferencing operates under an informational constraint. It is unable to provide visual information to participants. Teleconferencing is an attempt to gain the advantages of both systems. It provides visual information to the conferees and they need not be physically proximate.

While providing the advantages of both face-to-face and audioconferencing, teleconferencing also has some of their disadvantages. It allows for meetings where participants are at a distance, but removes the pleasure of travel. It allows visual information to be provided to participants, but does not allow them to participate in activities which may otherwise occur when people meet together. Teleconferencing systems are expensive to use. Costs for Confravision (England's teleconferencing system) are likely to be between $300-500 per hour. Unless teleconferencing can overcome some of the human and economic barriers, it cannot become a successful venture. The importance of the human barriers must be stressed. The economies of scale dictate that as usage increases, the cost of use decreases. Hence, the economic barriers are, to a large extent, contingent upon human factors.

Unless large disincentives for travel are forthcoming, people will still engage in travel. The potential of teleconferencing seems to be in allowing some activities, those which were not served adequately by prior communication structures, to be conducted more efficiently and effectively. Users must prefer teleconferencing over other communication modes in terms of its ability to satisfactorily serve the purposes for which they are assembled. Teleconferencing need not be a substitute for all travel and face-to-face communication. It may enhance the face-to-face meeting for those who do attend by allowing more effective preconference planning (teleconferencing as a supplement to face-to-face meetings). It may also allow others to attend the meeting who otherwise would not have (teleconferencing as a substitute for face-to-face meeting).

Researchers have begun to look at conferencing systems with increased interest and a substantial body of knowledge has emerged. Unfortunately the research has, with little exception, been unsystematic and lacked cohesion. Such is almost always the case in fields of inquiry with weak or undeveloped theoretic perspectives. A framework for integrating the research is necessary. Only within such a framework can discrepant studies be compared, and future research planned. A large disorganized body of literature is of little use to the planner or scholar. The purpose of this work is to propose such a framework, organize and summarize what is known, and specify areas of needed study. The work concludes with an evaluation of the framework as an organizing and generative tool.

The framework proposed is functional analysis. It is applied to communication at four system levels, the individual, dyad, group and large organization. At each level, critical communication variables are identified which are essential to the well being of each system. Activities which maintain required levels of these variables are also specified. What the framework allows is organization of the research to discover ways mediated conferencing systems affect critical variables, communication activities and their relationship to each other. Such an analysis is difficult, complex, but well worth the effort. It yields an organized body of knowledge, useful to the professional and scholar.

6

I

FUNCTIONAL ANALYSIS

The framework applied to telecommunication research must consider the goals of the systems using telecommunication devices and must be sensitive to the processes which allow the achievement of system goals. Functional analysis is embedded in the assumption that ". . .the consequences of some behavior or social arrangement are essential elements of the causes of that behavior (Stinchcombe, 1968: 80)." This principle is most familiarly exemplified by operant conditioning. In terms of communication, this implies that the causes of certain communication phenomena (behavior) are the maintenance of critical variables which are essential for the survival of the communication system.

Stinchcombe (1968) outlined the type of situation to which a functional explanation applies:

> Whenever we find uniformity of the consequences of action but great variety of the behavior causing those consequences, a functional explanation in which the consequence serves as a cause is suggested (p. 80).

Hence, a variety of behavior should produce an equifinal structure. The system maintains critical variables. Critical variables are those which are essential to the survival of the system. If these variables are not of sufficient magnitude or of too great a magnitude, the system will fail to survive.

An example of functional explanation might be in order at this point. There are several communication behaviors which lead to an individual's acquisition of information. A certain level of information input is required so that an individual may adapt to the environment. When information is acquired at a rate which is too slow or fast, the resulting consequence is some deviation from the individual's normal information load. If the individual's information load deviates from the preferred levels communication mechanisms are instituted to restore balance. If these mechanisms fail the individual will not be able to adapt to his/her environment and will not survive as a functional part of the social structure. In this example information load is the critical variable. When it is too high or too low, it causes the communication mechanisms to try to restore homeostasis. These mechanisms must continue to operate until homeostasis is achieved. If they do not operate properly the individual will fail to adapt to the environment.

Functional explanation, in regard to interaction via teleconferencing, can be fruitfully applied when one considers the set of interactants as the system, and communication behaviors as the structures which maintain critical variables of the system. As such, the electronic device may be viewed as something which intervenes between system components and alters communication structures. This may enhance or retard the ability of the system to respond to changes in critical variables. If the ability of the mechanisms to restore homeostasis is greater via teleconferencing than other modes of interaction, teleconferencing should be the mode of choice (over audioconferencing and face-to-face). If the ability of the mechanisms is retarded, relative to other modes, the other modes may be preferred.

An analysis of the impact of teleconferencing on communication is central to the issue of feasibility. This does not imply that other analyses are not or will not be fruitful in terms of assessing the feasibility of teleconferencing. It does imply that teleconferencing will not be feasible unless it allows communicators to fulfill some of their goals more easily via teleconferencing than with other communication systems.

Functional explanations are sensitive to the specification and maintenance of critical variables and the activity of maintenance mechanisms. Functional explanations do not assert that the maintenance of critical variables is necessarily "good." Teleconferencing may result in an increased amount of cohesion among members of a group who previously could not communicate often due to their geographic dispersion. While this may be good for that group, it may not be good for other groups to which members of the teleconferencing group also belong. No judgement is made by the theory as to the value of this change. The value of this change must be judged by the reader, in terms of its impact on other systems in the environment, as well as subsystems within the group.

Applying functional analysis to teleconferencing systems

The essential steps for applying functional analysis have been outlined by Monge (1972).

1. The system under study must be specified as well as the component parts and their interrelationships.

2. The systems environment must be specified.
3. The traits of the system which are considered essential for it's existence must be specified.
4. The values which each trait may assume, and in particular the range of values within which the trait must stay for the system to continue.
5. The mechanisms by which the systems components collectively keep the traits within the limits required for the system's existence must be discovered. The mechanisms must also be understood in terms of the potential impact of internal system changes or of changes in the environment.

Were teleconferencing used by only one kind of system of interactants, specification of the components would be rather routine. However, several types of systems may use teleconferencing for communication. Specifically, the number of interactants as well as the goals of interaction may vary considerably. Many of these complications can be dealt with by utilizing the concept of system levels.

Level I - The individual. There are four major system levels commonly used in human communication research. The first level is that of the individual, communicating to and receiving information from the larger environment. Farace, Russell and Monge (1976) outlined two basic research approaches at this level. The first considers communication content, or communication channels, or different combinations of content and channel as determinants of the individual's knowledge, attitudes or behaviors. Conferencing research using this approach is plentiful. Essentially, researchers vary mode of communication (face-to-face vs. teleconference vs. audioconference) and assess attitudes toward the system, toward other group members, toward the group as a whole, etc. Some teleconferencing research, conducted by the Communication Studies Group in London, has also varied type of meeting (negotiation, conflict etc.). The second common research strategy at the individual level involves the assessment of individuals in order to predict subsequent communication behaviors. The teleconferencing literature has a few examples of such research with the dependent variables being attitude toward the conference mode.

It is this authors' contention that research concerning attitudes and teleconferencing are not properly analyzeable at the individual level. There is no research which indicates that attitudes have critical levels which must be maintained in order for the individual to survive as a system. On the other hand, attitudinal similarity has been shown to be critical to the survival of higher level systems such as dyads and groups. An individuals attitude toward another person or toward the medium of communication is not going to determine whether he or she will survive as a social unit. Such attitudes may be critical to the survival of a dyad or higher level system of which the individual is a part.

The above assertion dictates the need to examine teleconferencing at system levels higher than the individual. Further justification for the analysis of higher level systems is attributable to the nature of teleconferencing itself. Teleconferencing allows interactive communication among individuals. As such, it affects the relationships among individuals directly. It is these relational aspects which are most likely to be affected by teleconferencing. Higher level systems must be analyzed in order to fully understand the impact of mediated conferencing.

Level II - The dyad. The system level which follows the individual is the dyad. Weick (1967) contended that the transition from the individual to the dyad is one of the crucial transitions of a communication system because: ". . .there is interdependence, reciprocal behavior and the necessity for accommodation to another person (p. 24)." At the dyadic level then, the relational aspects of communication emerge. It is precisely these variables which require shared information, feedback and interaction.

Level III - The group. Of profound interest in the area of teleconferencing are the potential changes in group structure which may be fostered. Removing the constraint of physical proximity could significantly alter the structure of ongoing groups, allowing them to be more open than before. At the group level, the phenomenon of coalition formation allows one to investigate the phenomenon of control, cooperation and competition, as well as social influence.

Level IV - The organization. The fourth level outlined is that of the organization. Specifically the communication that occurs between organizational members. Typically this is done by analyzing the communication networks of the organization, and assigning roles or functions to individuals or groups who belong to the organization.

Now that the basic steps have been outlined it is possible to proceed with the analysis. The next 4 sections will use functional analysis by level in an attempt to specify critical variables and organize the extant teleconferencing research.

II

LEVEL I - THE INDIVIDUAL

The individual may be seen as a system with one component. In order for the system to survive it must be able to adapt to its social environment. The social environment is composed of other individuals, as well as dyads, groups and organizations. The critical variable which allows the system to continue in the face of an equivocal environment is information load. The individual must be able to receive and process information at a sufficient rate so that successful adaptation is possible. It must also be remembered however, that information overload is a possibility. An individual may be attempting to process information which is too rapid and/or complex to handle.

Research relevant to the critical variable of information load and teleconferencing has been conducted by Weston, Kristen and O'Connor (1975). The experimenters manipulated mode of communication (face-to-face vs. teleconferencing vs. audioconferencing) with several relevant dependent variables. All groups met three times for approximately 37 minutes/meeting. The researchers reported that there was little difference in the number of words spoken in the face-to-face and teleconferencing conditions, but the frequency was considerably higher for these groups than for the audioconferencing group. Audioconferences were characterized by more frequent but shorter messages than were teleconferencing and face-to-face. Hence, while the number of messages (message rate) was highest for the audio condition, the messages in this condition were less complex than in the other two conditions. Information load is a function of the product of rate and complexity. The researchers report their message rates as follows: Audio--14.8/min., Video--13.1/min., Face-to-face--9.5/min. If one assumes that a crude measure of message complexity is the length of each message, the following message lengths are relevant: Audio--11.0, Video--13.3 and Face-to-face--13.8. The average information load (words/minute) for each conference is as follows: Audio--162.8, Video--174.2, Face-to-face--178.6. Hence, the average information load was highest for face-to-face, closely followed by teleconferencing and lowest for audioconferencing. Despite the fact that complexity was lowest for the audio group, this group was characterized by twice as many requests for information than were either of the other groups. In essence, information load for the individual in audioconferencing was not sufficient for the task at hand (relative to individuals in other groups), requiring extra effort on the part of the participants.

The task for these groups was to propose changes and improvements in a basic communication course, and modes of implementing the changes or improvements. As such they discussed dimensions of the task, proposed recommendations, and modified these proposals into final form. Messages related to the task were categorized in terms of their complexity. If the message dealt with only one aspect of the course it was categorized as simple, if it dealt with more than one aspect it was categorized as complex. In the audio condition 19% of the task communication was categorized as complex, in video 29%, in face-to-face 28%. Hence, the proportion of complex messages was higher in the video and face-to-face groups than in the audio group. The results further indicate that even though the audio group spent the greatest portion of time discussing the problems, they had the highest ratio of simple to complex messages which made recommendations, and the lowest absolute number of messages which made recommendations.

This study shows that audioconferencing restricts the complexity of messages when compared to teleconferencing or face-to-face communication. It also indicates that this reduced complexity was dysfunctional. Despite the fact that audioconferees asked for information relatively frequently, individuals in this condition proposed the greatest proportion of simple task related messages. Teleconferencing was closer to audioconferencing on the variables of message length and frequency. However, information load (words per minute) in the teleconferencing group was closer to the load of the face-to-face group. This was due to relatively large number and length of pauses in the audioconference. Teleconferencing was also very close to face-to-face in terms of message complexity. In summary, while teleconferencing does seem to reduce the information load for individuals slightly, on the whole the information load for individuals in teleconferencing is very similar to that of face-to-face communication.

III

LEVEL II - THE DYAD

According to Weick (1967) the critical

variable which emerges at the dyadic level is the ability of the system's components to coordinate behaviors. In order to do so there must be the possibility of mutual influence and accommodation. Hence, at the abstract level, the critical variable (coordination of behavior) and the maintenance mechanism (mutual influence and accommodation) have been identified.

The mechanism as put forth above may be broken down further so the theory and research in dyadic interaction may be used to interpret the findings of conferencing research. One of the most fruitful approaches to the study of dyadic communication has been Newcomb's (1953) Coorientation Paradigm. Within this paradigm, the consequences of communication are: agreement (similarity of orientation toward an object) and accuracy (the degree of similarity between one's estimate of another's orientation toward an object and the other's expressed orientation toward that object).

If coorientation is to be taken as a paradigm it is essential that the objects of orientation are such that agreement and accuracy on them are necessary if the dyad is to function as a communicative system. Coorientation on communication rules is necessary if one is to predict the response of another to one's messages. Without coorientation on communication rules the predictions necessary for behavioral coordination are impossible. Therefore, part of the function of communication in dyads should be the maintenance of coorientation on communication rules.

A second mechanism which is critical to the survival of dyads is the extent to which there is agreement and accuracy (Newcomb, 1953) between dyadic members on perceptions of each other. It may be argued that unless a certain degree of agreement and accuracy are maintained in terms of attitudes and other interpersonal perceptions, coordination and positive affect will suffer. Unless perceptions of the other member of the dyad are sufficiently accurate, in the long run the dyad will suffer.

Other characteristics have been considered critical variables for dyadic communication. Interpersonal attraction is commonly considered a characteristic of ongoing dyads (Homans, 1950, Newcomb, 1953). Often however, dyads remain intact due to environmental pressures regardless of the degree of interpersonal attraction. A married couple may remain together longer than an unmarried couple in part due to the social stigma of being divorced. Business partners may remain together because of a fear that breaking the partnership might endanger ones financial security. Hence, attraction does not appear to be a critical variable or maintenance mechanism in dyads. Rather, it appears to be a product of coordination in some ongoing dyads. Attraction would be a critical variable for dyads when environmental pressures keeping the dyad together were minimal.

A similar type of logic applies to the attitude of system components toward the dyad as an object of orientation. While positive attitudes toward a dyad indicate that the dyad exists, environmental constraints may force the dyad to continue despite the absence of these positive attitudes. Hence, positive attitude toward the dyad may be an indicator of the existence of a dyad if environmental pressures are minimal.

One further area of interest is attitude toward the conference medium itself. It is through these channels of communication that coordinated behaviors are achieved. While not critical to the survival of all dyads, attitude toward the conference medium should be critical to the survival of dyads which are environmentally constrained so that their choice of conference mode is limited. If the attitude toward the dyad or the other person is not sufficiently positive to overcome a negative attitude toward available conference modes the dyad will fail to survive.

Thus far, the author has isolated the critical variable (coordination of behavior), maintenance mechanisms (coorientation on rules and interpersonal perceptions) and the conditions under which attitude toward the other, the dyad and conference mode may be critical variables. It was suggested that if social or economic pressures were sufficiently strong a dyad may survive despite the lack of positive attitudes toward the other person, the dyad or conference mode. However, the survival of such a dyad over a lengthy period of time is less likely than when the three sets of attitudes are positive. This section will now turn to the literature on mediated conferencing and dyads.

Attitude toward conference mode. Considerable research has assessed the individual's attitude toward teleconferencing (as compared with attitudes toward face-to-face and audioconferencing). This research assumes that positive user attitudes are essential if teleconferencing is to become a viable innovation. Are positive user attitudes toward teleconferencing essential for the survival of the individual as a social unit? The answer is no. It does become critical however, when considering the dyad as the unit of analysis.

If an individual's attitude toward teleconferencing diverges from that of others, the individual is likely to move further away from those whom he/she is divergent with. This might be due to receiving different information or information in differing degrees of depth than others. The divergence might be further enhanced if one considers research on attitudinal similarity and interpersonal attraction. Hypotheses based on Balance and Coorientation theory have been repeatedly confirmed. The greater the attitudinal similarity, the greater the interpersonal attraction (Newcombe, 1961, Byrne & Nelson, 1965, Byrne & Clore, 1966, Byrne & Griffitt, 1966). Hence, attitudes may not be critical to the individual when analyzed alone, but are critical when analyzing dyads.

Considerable research has been conducted using the information theoretic construct "bandwidth" to predict attitude toward the communication medium. Weston and Kristen (1973) outlined this perspective:

> Simply stated, the quality and diversity of data available for processing is greatest in face-to-face communication, less in video systems, and least in audio systems. To the extent that the richness of the available information base in conference situations is directly related to such things as mutual stimulation among participants, greater awareness and appreciation of each other's intention, reaction, and attitudes (see McGrath and Altman, 1966), it follows that the face-to-face conference mode will generally be most intensive and "audio only" teleconferencing the least on wide array of conference parameters (p. 5-6).

Considerable effort has been expended in obtaining measures of attitude toward the communication medium. Early research on attitude toward teleconferencing systems (Champness 1972a, 1972b) suggested that attitudes toward communication mode might best be thought of as multidimensional. Champness used the semantic differential technique to measure the attitudes of civil servants toward interpersonal communication media experienced in a research laboratory. In the first study, factor analysis yielded five orthogonal dimensions. The dimensions were labeled: Aestheticism, Evaluation, Activity, Potency, and Privacy. Based upon the results of his second study, Champness suggested the existence of four dimensions, labeled: Spaciousness/Aestheticism, Evaluation, Privacy and Straightforwardness.

In his first study, Champness found that the communication modes of face-to-face, teleconferencing and audioconferencing produced differences on three of the five attitudinal dimensions. Face-to-face and teleconferencing were rated significantly higher than audioconferencing on the dimensions of Aestheticism and Evaluation. Teleconferencing was rated significantly lower than the other two modes on Privacy. In the second study, face-to-face was rated higher than teleconferencing which was rated higher than audioconferencing on Spaciousness/Aestheticism and Evaluation. Face-to-face was rated higher than the other two media on Privacy. Ryan (1976) used Champness's first study as a guide for measuring mode-related attitudes. His results are an exact replication of the results reported in Champness's first study with one addition. Teleconferencing and audioconferencing were perceived as more potent than face-to-face.

The above research provides one consistent finding regarding teleconferencing and face-to-face communication, users perceive teleconferencing to be lacking in terms of privacy. Regarding audioconferencing, it is generally perceived as being lower than the other two on the dimensions of aestheticism and evaluation.

Christie (1974a) argued that these studies suffer from one major weakness. The scales employed for these studies were based on Snyder and Wiggins' (1970) reanalysis of the Osgood, Suci and Tannenbaum (1957) scales. He questions the adequacy of the sample of bi-polar adjectives since the Osgood et at. (1957) data were collected in a context irrelevant to telecommunication.

In order to alleviate this problem, Christie (1974a) had subjects provide five descriptors for each of four communication media: the standard business telephone, face-to-face contact, audioconferencing and teleconferencing. Generation of bipolar adjectives from these descriptors resulted in 25 bipolar scales. To these were added 31 scales from previous research of his own and from the research of Champness reported earlier.

Later, thirty-six subjects evaluated [illegible] concepts, including five communication modes on these bipolar adjectives. Each subject-concept combination was treated as a single case. Factor analysis yielded an oblique nine dimension solution (using the Scree test). The factors were: General Evaluation, Social Presence (personal, aesthetic, humanizing), Novelty, Safety, Privacy, Meaningfulness (necessary, important), Limitation, Practicality and Convenience.

Analysis of Variance yielded significant effects for intermode differences across all dimensions. In terms of General Evaluation, the communication modes were ordered as follows: face-to-face, teleconferencing, telephone, letter and audio. The ordering was highly similar for the factors of Meaningfulness, Social Presence, Practicality and Limitation. The order of the media in terms of their limitations is, of course, the opposite of the order presented above.

The telephone and letter were judged more convenient than teleconferencing and audioconferencing. Audioconferencing was judged highly Private but the least Safe. The letter was judged as being highly Private and most safe. The media were ranked as follows in terms of novelty: teleconferencing, audioconferencing, letter, telephone and face-to-face.

While the above study probably used a better sample of rating scales, the stability of the factor structure is suspect. It must be recalled that there were only 36 subjects. The researcher attempted to overcome this problem by treating each subject-concept pair as an independent case. Obviously, this violates the assumptions of factor analysis as well as the particular Anova program used. The extent to which this is a significant problem may be analyzed in terms of the results of his study compared to previous ones. Analysis of the scales which loaded on each factor indicates that factor structures which had emerged in previous research also emerged in this study. The relatively complex factor structure is due to the greater variety of rating scales used in this study. The author suggests that future research should be directed at discovering the predictive value of these factors in terms of media use.

The research cited thus far does not yield consistent support for the "bandwidth" rationale. In fact, the research is full of results which are contrary to the predictions of this rationale. In an attempt to provide an overarching perspective upon which to produce directional hypotheses Weston and Kristen (1973) appear to have erred. There does not appear to be a logical reason for expecting communication systems with greater information capacities to be more private than systems with lesser capacities. If the task at hand requires little information transfer between components, why should communication systems with large information capacities be evaluated more positively than a system with a more appropriate information capacity? Hence, even at this early stage of research, the viability of this perspective as a theoretic explanation for attitude toward communication systems has been discounted. Further research is needed which addresses the determinants of attitude toward communication systems. Such research should consider the use to which the system is put.

Factors which influence selection of conference mode. Research by Christie (1974b) and Christie and Holloway (1974) indicated that the factor which best discriminated between conference mode was the one labeled "General Evaluation." Subject's attitudes were assessed and coded as either favorable or unfavorable, and were related to the subject's decision to telecommunicate or to travel. This procedure yielded a Contingency coefficient of .255 ($p < .01$). Thus, a user's attitude toward the communication system should effect future use of the system.

Several other elements which predict use have emerged beside attitude toward the medium. Christie (1974b) identified three: the degree of person orientation of the meeting (content of the discussion is socio-emotional vs. task oriented), degree of acquaintance of the participants, and amount of travel time. Telecommunication was least acceptable when the person orientation of the meeting was high and level of acquaintance was low. The most acceptable condition was when person orientation was low and acquaintance was high. There was no difference for the other two conditions (high acquaintance-high person orientation, low acquaintance-low person orientation). The ability of travel time (coded as two hours or more vs. less than two hours) to predict use of telecommunication was weaker than the factors of person orientation, attitude toward the meeting, and acquaintance.

Christie (1974b) reported a contingent relationship between attitude toward the medium and the subjects decision to use telecommunication, or travel and face-to-face communication. When teleconferencing is seen as either acceptable or unacceptable as dictated by the level of person orientation and acquaintance, the relationship between attitude toward the medium and the use of teleconferencing is lower than when degree of person orientation and acquaintance do not allow a clear preference. Thus, attitude toward the medium is a more important determinant of a subject's choice when the situation does not obviously favor either telecommunication or travel.

The above research yields important results concerning the survival of a dyad using telecommunication. Firstly, people perceive face-to-face as the medium of choice for conducting person-oriented communication when acquaintance is low. People choose equally between face-to-face communication and teleconferencing for person oriented communication when acquaintance is high. While no research comparing audioconferencing, teleconferencing and face-to-face conferencing has been brought to bear, the choice between them may be a function of the time necessary for the participants to get together and the length of time they have been apart. Persons involved in social relationships may prefer remote communication over face-to-face when travel time is great. Similarly, when close acquaintances have not seen each other over a long period of time and are too far apart to travel, they may prefer to see each other rather than use the telephone. Thus, it would be hypothesized that teleconferencing of person-oriented communication would be preferred when travel time is high and the dyad had been separated for long periods of time. The plausibility of the distance-travel time hypothesis is tempered somewhat by the findings of Champness (1972) and Ryan (1976) which indicated that teleconferencing was perceived as less private than audioconferencing. Unless this attitude changes, teleconferencing may never be the mode of choice for conversations that are high in person orientation.

Teleconferencing appears to be the medium of choice over face-to-face communication when person orientation is low and acquaintance is high. If the members of the dyad are acquainted and the conversation is not person oriented the dyad is likely to survive using teleconferencing.

Effects of conference mode on attitude and attitude change. Conference mode has been shown to have an effect on attitude change and negotiation. The research on attitude change is especially intriguing. Short (1972) reported the results of two experiments. The first found greater opinion change in the audio-only condition than in the face-to-face condition. The second experiment yielded similar results but the differences were not significant. Young (1974) reported findings identical to Short's second experiment. Young's results further indicated that seven of twelve dyads reached agreement in the audioconference condition while only four agreements were reached in the face-to-face condition. In a related experiment Wall and Boyd (1971) presented a persuasive message in written form or via videotape or face-to-face. Written messages were found to be significantly more effective than videotape or face-to-face messages. Once again, the results are contrary to predictions of the "bandwidth" rationale. A decrease in the degree of personal contact results in an increase in the persuasiveness of a message.

It should be noted that in all conditions persons must spend time and effort in understanding the other's point of view. Self-perception theory (Bem, 1972) would posit that this effort requires justification. A self-perception analysis would argue that people justify their effort (participation in the dyad), in part by attributing their behavior to external causes. People in the audio groups have less information upon which to justify their effort. They must justify their effort based on the verbal messages and arguments posed by the other. They may attribute their effort to the quality of the opponents arguments and/or to attributes of their opponents. Attributing greater quality to an opponent's arguments makes them, and their proponents, more acceptable to yourself, hence, greater attitude change. Short (1972) observed that in situations involving high degrees of interpersonal conflict (high effort), evaluations of the other were more favorable following audio than face-to-face interaction.

Another plausible explanation was provided by Wilson (1974). This author argued that each medium sets limits upon the level of intimacy between participants. The greater the bandwidth the higher the level of intimacy. In a conflict situation the more intimate media emphasize negative feedback and the rejection of the other. The participants are therefore more defensive of their own opinions, hence less opinion change. This explanation is highly similar to one which might be provided by Social Judgement Theory. In situations which are salient (face-to-face) a person's latitude of acceptance is smaller and the latitude of rejection is larger than when in less salient situations (audioconference). This would result in greater acceptance of opponent's arguments in the audio condition.

The above research indicates that negotiation is likely to be more successful via audioconferencing than via teleconferencing or face-to-face. However, not all research supports such a contention. Wichman (1970) studied the influence of visual-auditory contact with a game partner on cooperation. The experimenter manipulated the amount of contact (none to audio plus face-to-face) and found a progressive increase in cooperation as contact increased, especially when visual information was provided. Similar results have been reported by LaPlante (1970) who observed that players in face-to-face or teleconferencing contact cooperated significantly more than did those communicating by telephone. Weston and Kristen (1973) reported on subjects perceptions of the extent to which they felt they were accepting of others contributions, had their own contributions accepted and felt that their contributions were comprehended by others. Subjects reported higher scores for all these concepts in the face-to-face and teleconferencing conditions than in the audioconferencing condition.

The difference between these two sets of studies may be due to the type of interaction prescribed by the experimenters. In the first set of studies (Short, 1972; Young, 1974) subjects were selected so that they would have opposing views and were given the task of persuading the other to their own point of view. Clearly a competitive situation. The second set of studies allowed the subjects to cooperate in order to achieve success. They were not required to "beat" their partner. Hence, the studies clearly differ in the degree of cooperation and competition specified by the experimental task.

The results of these studies suggest that when competition is used to gain compliance there is greater success via audioconferencing. The second set of studies indicate that cooperation is greater in face-to-face and teleconferencing than in audioconferencing. These results suggest a need to sort out the relationships among conference mode, cooperation and competition. Clearly, when the negotiation is completely competitive (as in the first set of studies) there is greater persuasion in the audio condition. However, most negotiations are not so clearly competitive (only one winner). Furthermore, it may be that audioconferences foster competition. Support for this contention is provided by Weston and Kristen (1973). Subjects in the audioconferencing condition perceived their arguments to be less accepted and comprehended than did subjects in the teleconferencing and face-to-face conditions. Subjects perceptions of accepting the contributions of others was also lowest in the audioconferencing condition. Clearly, research is needed which considers the relationship between conference mode and the competitive-cooperative nature of the task in order to determine their impacts on conflict resolution and attitude change.

Communication rules. Communication rules are necessary for the maintenance of coordination in dyads (Cushman and Whiting, 1972, Farace, Russell & Monge, 1976). Cushman and Whiting categorized communication rules into two types, content rules and procedural rules. They further specified that some degree of consensus on rules is necessary for communication to occur.

While no research to date has examined the effect of conference mode on the establishment of consensus on communication rules, research on the experiences of participants provide results which indicate that mode of conference changes some of the procedural rules of the conference.

Christie (1975) found that conferees reported the following phenomena to be occurring in comparisons of teleconferencing with face-to-face communication. These observations seem to be changes from the normal procedural rules of face-to-face meetings. These changes were as follows: teleconferencing forced discussants into more ordered thought, it allowed discussants to consult papers more frequently, it forced discussants to listen to one another more attentively, it reduced the number of interruptions.

While the effect of conference mode on the rules of the dyad is important, a change in communication rules is not necessarily critical to the survival of the system. It is not critical to the dyad that these rules change from mode to mode unless these changes affect user attitudes, or if the discussants cannot adapt to the rules of each mode. However, the extent to which communication rule emergence and coorientation is impeded or enhanced by conference mode is critical. The mode in which this process occurs most easily should be the mode of choice. If coordination is critical to the survival of the dyad, and the emergence of rules and coorientation on rules alters the degree of coordination, then one has a functional explanation for coordination and the accomplishment of dyadic goals. Coorientation on rules is a mechanism which affects coordination which allows the dyad to achieve its goals. The extent to which this process differs in each communication mode has yet to be assessed.

Interpersonal perceptions. A second mechanism which may affect coordination is the extent to which there is agreement and accuracy on the perception of others. The coorientation concept of accuracy has been used in research aimed at the effects of medium of communication on getting to know others. Short (1972) reported that in two experiments, accuracy in judging another's opinion was greater in face-to-face and teleconferencing than in audioconferencing. Further, the direction of the distortion was such that while all persons underestimated the other's opinions (said they were less intense), the audioconference group underestimated the difference more than did those in the other two conditions. This would be consistent with the notions of assimilation and contrast in Social Judgement Theory. Those in the audioconference condition had the widest latitude of acceptance due to this medium's provision of lesser salience. Since these dyads were composed of individuals with differing opinions by experimental design, the results indicate that subjects in the audio condition perceived the other's opinion closer to their own than did subjects in the other groups. The individuals in this condition were most able to assimilate (distort the other's opinion so that it was more like one's own). This provides an explanation for Young's (1974) finding that consensus was more easily achieved in audioconferencing than in face-to-face communication. Consensus was more easily achieved by individuals using audioconferencing because they perceived the other's positions to be closer to their own than they actually were, and the distortion was greatest for those in this group. This situation appears very similar to what Scheff (1967) has called "false consensus." The implications are clear. If such distortions continue uncorrected, coordination will become increasingly difficult and the dyad may fail to survive.

Summary. The preceding section has analyzed the relevant literature on mediated conferencing and dyads. The author has outlined the critical variable "coordination of behavior" and the maintenance mechanisms "coorientation on rules" and "coorientation on interpersonal perceptions." It was indicated that attitude toward the other person, the dyad and conference mode may be critical variables under conditions which do not constrain the dyad to remain together.

The research on attitude toward conference mode provided results which disputed the "bandwidth" rationale. The results also indicated that teleconferencing was consistently perceived to be less private than both audioconferencing and face-to-face interaction. Audioconferencing was judged to be lower than the other two conference modes on aestheticism and evaluation. Four factors have emerged thus far which influence choice of conference mode. The factors are the degree of person orientation of the meeting, the degree of acquaintance of the participants, the amount of travel time and evaluation of the conference mode. Telecommunication is the mode of choice when person orientation is low and acquaintance is high. Face-to-face is the mode of choice when person orientation is high and acquaintance is low. Travel time is positively related to the decision to use telecommunication over face-to-face. The influence of evaluation of conference mode on selection of conference mode has been found to be contingent upon the first two factors. Evaluation is a more important determinant of a subject's choice when the situation does not clearly favor telecommunication or travel and face-to-face. No research to date has considered these four factors simultaneously for predicting the selection of conference mode. Such research is needed.

Theoretic explanations were provided for the finding that attitude change attempts appear to be more successful in audioconferencing than in teleconferencing or face-to face. Apparently conflicting results concerning conference mode and cooperation were reconciled by considering the differences in the tasks of subjects in both sets of experiments. Further research concerning the relationship between conference mode and task was suggested. It is further suggested that such research concern itself with coordination of behavior as the critical dependent variable.

Research indicated that there appears to be an effect of conference mode on communication rules. However, the emergence of different rules was not considered as important as the ability of dyads to achieve coorientation on those rules. It was indicated that the extent to which coorientation on communication rules is affected by conference mode has yet to be addressed.

The research reviewed concerning the mechanism "coorientation on interpersonal perceptions" indicates that perceptions are distorted most in audioconferencing. This phenomena was explained in terms of Social Judgement Theory. It was suggested that such "false consensus" could lead to the dissolution of the dyad in the long run.

IV

LEVEL III - THE GROUP

Perhaps the most important variable in terms of it's criticality for groups is cohesiveness. Festinger (1950) defined cohesiveness and its relationship to communication as follows:

> Cohesiveness of a group is here defined as the resultant of all the forces acting on the members to remain in the group. These forces may depend on the attractiveness or unattractiveness of either the prestige of the group, members in the group, or the activities in which the group engages. If the total attraction toward the group is zero, no forces to communicate should arise; the members may as easily leave the group as stay in it. As the forces to remain in the group increase (given perceived discrepancies in opinion and given a certain relevance of the item to the functioning of the group), the pressure to communicate will increase.

Hence, when there is deviation, the greater the cohesion the greater the amount of communication to reduce the deviation. Furthermore, research by Bovard (1951) and Festinger, Schacter and Back (1968) indicated that the power of the group to influence individual members increases as cohesiveness increases. This increased power and frequency of communication causes increased similarity and cooperation (Deutsch,1949) which in turn causes greater group cohesiveness (Heider, 1958, Newcomb, 1953, Festinger, 1954). Central to this circular causal sequence is communication. It is the mechanism by which the resultants of cohesion influence the amount of cohesion.

Were the causes of cohesion purely the resultants of cohesion one would have a circular causal model which predicts an ever increasing amount of cohesion within groups. Certainly this is not the case. Group cohesiveness fluctuates over time. Obviously, other factors in the group's environment cause fluctuations in cohesiveness. Thibaut and Kelley (1959) asserted that group members compare the consequences (benefits and costs) of belonging to the group with the consequences of belonging to other groups or no group at all. As these contingencies change, cohesiveness fluctuates. Schacter (1959) studied the effects of anxiety on the desire to be with other people (affiliative tendencies). He found that as anxiety increased, affiliative tendencies increased. Cartwright (1968) asserted that these results indicate that group cohesiveness could be expected to increase when members of a group encounter threatening or ambiguous situations.

Cohesiveness may fluctuate as a function of the groups ability to meet the goals of its members. Groups which cannot satisfy member's goals as well as other groups will decrease in cohesiveness (Hagstrom and Selvin, 1965). Hence, there are several environmental factors which influence group cohesiveness.

Farace, *et al*. (1976) and Cartwright (1968) argued that communication is a mechanism by which the critical level of the variable cohesiveness is maintained. Without cohesiveness, interdependence, cooperation and mutual control are impossible.

Shepard (1964) identified three additional variables critical to the survival of groups. They were: *adaptation* to factors outside the group, *instrumental control* over those things within the group which are relevant to performing the task (assigning tasks, performing activities), and *expression and management of feelings*.

Farace *et al*. (1976) pointed out, based on research by Schacter (1951), that suprasystems have little tolerance for subsystems which do not behave accordingly. The larger system (environment of the group) eventually will dictate the survival of the group. Hence, the group must be able to adapt to environment contingencies. Concerning *instrumental control* Farace *et al*. (1976) stated that the abilities of each member of the group must be organized into an effective and coordinated effort; ". . .a small group which has tremendous resources but lacks the ability to control them will soon become dysfunctional."

Bales (1955) observed that even in task groups, action tends to oscillate between task and socio-emotional content. This oscillation is crucial to the survival of the group. Farace *et al*. (1976) pointed out that a group can quickly disintegrate if it does not cope with the socio-emotional aspects of group life.

There is very little research on the effects of conference mode on group interaction. Most of the research to date has analyzed dyads. What little research there is however, does provide some insights into the effect of conference mode on the critical variables outlined above.

Cohesiveness. This critical variable has been addressed indirectly by investigating the process of coalition formation within groups using telecommunication systems. The potential exists for two subgroups to emerge if part of a group is at one mediated conference node while the rest of the group is at the other node. Weston and Kristen (1973) noted that conferees often make the distinction between "us" and "them" when referring to members of the immediate and mediated nodes. These labels may be symptomatic of conferees perceiving members of the mediated group differently from the immediate group and result in behaviors which are, in part, dictated by physical proximity. This may be dysfunctional for groups which require cohesiveness among all group members or require a pattern of cohesiveness which is different from the one dictated by physical proximity.

Weston and Kristen (1973) investigated three factors which may be indicators of coalition formation, they were: 1) acceptance of the contributions of others, 2) perceptions of others acceptance of one's own contribution, and 3) perception of other's comprehension of one's own contributions. Based on the "bandwidth" rationale they hypothesized that the opposite group in face-to-face and teleconferencing would be rated higher on these three measures than it would be in audioconferencing, (in face-to-face the comparison was made between people seated on the same side vs. the opposite side of a table). Their results indicated the following: 1) Acceptance of other's contributions--People in the audio condition reported significantly less acceptance of others contributions than people in teleconferencing or face-to-face. Perceived acceptance of the contributions of the immediate group were not affected by condition, the only substantive problem occurred in acceptance of the contributions of mediated group members in the audioconference condition. 2) Perceived acceptance of one's contributions by others--Once again, the hypothesis was supported. Those in the face-to-face and teleconferencing conditions perceived themselves as being more accepted by members of the other group than those in the audioconferencing condition. A comparison of the mediated and immediate group evaluation in each condition provided interesting results. First, subjects in the audio group perceived themselves to be more accepted by the immediate group than by the mediated group. Secondly, the opposite was the case in face-to-face conferences. Thirdly, this had no effect in the teleconferencing condition. It appears that feelings of acceptedness travel across the table in the face-to-face situation while they cannot travel across the audio channel for those in audioconferencing. The experimenters cited research which indicated that people focus their attention more on those across from them at a table than they do to those seated next to them. It appears that teleconferencing equalizes this focus somewhat, resulting in no difference between nodes in terms of a person's feeling of the extent to which he or she is accepted. 3) Perceived comprehension of one's contribution by others--The hypothesis was confirmed once more. Those in the audioconference felt significantly less understood by those in the other group than those in face-to-face or teleconferencing.

The results of this study provide clear insights into the potential for the formation of cliques as a function of conference mode. Clearly, audioconferencing is conducive to clique formation with cliques forming at each node. It also appears that face-to-face communication may have similar drawbacks but in the opposite direction. Teleconferencing appears to have the least potential for the formulation of cliques based on intra-group spatial relationships.

Williams (1974) provided results which are relevant to the findings of Weston and Kristen (1973). The experimenter randomly assigned groups of four to one of three conditions; face-to-face, teleconferencing and audioconferencing. The task was to generate ideas relating to the problems of travel in Britain. In order to measure the patterns of support or lack of support one of the participants noted down the proposer, seconder and any dissenters for each idea. Results yielded significant effects for communication mode on patterns of support and dissent. Participants in the mediated conditions were more likely to support the person at their own end than a person at the other end. Patterns of support in the face-to-face condition were random. Audioconference participants were more likely to dissent from ideas proposed at the other end than from ideas proposed at their own end. Patterns of dissent were random in the face-to-face and teleconferencing condition.

Once again it appears that coalitions are being formed on other than rational grounds. Audioconferencing results in the formation of coalitions based on physical proximity. There is agreement between the results of Williams (1974) and Weston and Kristen (1973) on this point. However, the results do differ in terms of the effects of teleconferencing and face-to-face communication on coalition formation. While Weston and Kristen (1973) found teleconferencing to have no effect on perceptions of comprehension, acceptance and the accepting of others, Williams (1974) found patterns of support which indicate that teleconferencing may contribute to coalition formation. Similarly, in terms of apparent conflict, Williams (1974) found that patterns of support and dissent were random in the face-to-face condition while Weston and Kristen (1973) found that subjects perceived that those across from them were more accepting of their views than those seated next to them. The apparent conflict between these studies might be explained by further research which utilizes patterns of support and dissent as well as participants perceptions of support and dissent in order to determine how they are related. It may be that perceptions of support and dissent are most distorted in audioconferencing since less information is available to participants in this situation. It may also be necessary to have an independent observer code patterns of support and dissent rather than a participant. The coding may interfere with normal group processes by constraining group members who know that their patterns of support and dissent are being permanently recorded.

Communication mechanism. In a more recent study Weston, Kristen and O'Connor (1975) content analyzed the discussions of students who were charged with the task of generating suggestions for improving the basic course in communication. They report several findings relevant to the communication structures which emerged in their groups. In both teleconferencing and audioconferencing, communication designed to organize and orient the group to the task at hand was usually directed at the mediated node. This phenomenon was twice as strong in the audioconference condition. In the face-to-face condition almost all of such messages were directed toward the group as a whole. The pattern is identical for expressions requesting or providing information, expressions of agreement and understanding, and statements designed to be supportive and smooth hostilities.

The researchers also investigated negative emotional factors. In the audioconference disagreement was five times more likely to occur between people at different nodes than between people at the same node. In teleconferencing, disagreement was twice as likely to occur across node as compared to within node. 80% of the disagreement in face-to-face communication was addressed to the group as a whole. Of the remaining 20% the pattern of disagreement was identical to that of teleconferencing. Hostility in the audio condition was almost always aimed at members of the opposite node. Furthermore, this group experienced the greatest amount of hostility. Surprisingly, hostility was lowest in the teleconferencing situation while face-to-face produced hostility levels between audioconferencing and teleconferencing. The hostility of participants in face-to-face and teleconferencing was as likely to be aimed at one's own side of the table as they were to the other. A further change in cohesiveness which could be gleaned from the communication patterns was the frequency with which "we/you" distinctions were made. Those in audioconferences made 25 percent more references to this distinction than did those in teleconferencing. Both mediated groups experienced this phenomenon far more frequently than did the face-to-face group.

Cartwright (1963) indicated that one element which is related to the level of cohesiveness is satisfaction with the task. When satisfaction decreases, cohesion decreases. Weston, Kristen and O'Connor (1975) report that negative evaluations of the task occurred three times as frequently in the audioconferencing condition than in face-to-face, and twice as much as in the teleconferencing condition.

To summarize, mode of conference appears to have a strong impact on group cohesion and coalition formation in groups. Coalition formation appears to occur most strongly in audioconferences with coalitions forming at either node. Thus, the cohesion of the group as a system is negatively affected. This results in a concomitant negative evaluation of the task. Furthermore, it is apparent that members of audioconference groups are aware of the formation of these coalitions. The preponderance of evidence indicates that far weaker coalitions may form with teleconferencing, with some decrease in group cohesion. However, the earlier research of Weston and Kristen (1973) indicated that this does not seem to affect member's perceptions of understanding and acceptance by those at their own node as compared with those at the other node. Face-to-face conferencing seems to foster the least amount of coalition formation.

Adaptation. Almost all of the research to date has involved experiments where groups meet for a very short time. To date, researchers have not introduced any environmental disturbances in order to determine whether the ability of the group to adapt is affected by conference mode. It is this author's contention that this is an area in which research is sorely needed. Two types of studies are envisioned. First, short term experiments where an unexpected problem is introduced during the meeting. Second, longer term field experiments and surveys to determine whether groups composed of members at different locations using teleconferencing are more able to meet and discuss problems that arise and more successfully cope with those problems than groups who do not use teleconferencing.

Work load is one of the environmental contingencies which must be adapted to in organizations. For example, government agencies might allow research to determine whether teleconferencing allows for more rapid action on cases than do other conference modes. This should be the basic criterion measure for efficiency because it takes into account other measures of efficiency such as length of meetings, time necessary for setting up meetings and amount of time between meetings.

Instrumental control. Little research on mediated conferencing can be brought to bear on the critical variable instrumental control, the ability of the group to control its own resources. Weston, Kristen and O'Connor (1975) indicated that for an identical task, mediated conferencing groups spent more time organizing than did face-to-face groups. The audio groups sent approximately five times as many organizing messages as the face-to-face groups. The teleconferencing groups sent about three times as many organizing messages as the face-to-face groups. For both mediated groups however, the last meeting (there were three over a three week period) had the fewest number of organizing messages. It may be that the novelty of the conference mode caused a higher rate of organizing messages for the mediated conferences.

Even though organizing the effort of the group is critical, it must be remembered that the time spent organizing may be taken from time spent accomplishing the task. If novelty is the problem, it would be overcome by repeated use of the mediated system. However, not enough is known about the novelty factor or the normal occurrence of organizing messages in face-to-face task groups to make any judgement at this time. It must also be remembered that the time spent organizing in mediated conferences is a possible tradeoff for the time necessary for travel in face-to-face groups. Hence, teleconferencing may be the mode of choice when the effort expended in travel is more than the effort expended in organizing.

Jull and Billowes (1974) reported on instrumental control based on the results of interviews and questionnaires to determine user reaction to teleconferencing. Users reported that teleconferencing meetings are more prone to dictatorial control by the chairperson. However, since this was not based on any type of randomization of users or tasks, the results may be an artifact of the different types of meetings which the users normally conduct over teleconferencing as compared to face-to-face. For example, they reported that two types of meetings are conducted over teleconferencing before the medium is accepted as a substitute for routine meetings. These meetings were described as: 1) The urgent meeting and 2) The meeting to prepare for subsequent face-to-face meetings. It may be that these meetings would normally be dictated by the chairperson even in a face-to-face conference. Future research might examine whether leadership structure is affected by conference mode. If it is, the processes by which instrumental control is achieved would also be expected to differ by conference mode.

Expression and management of feelings. The final critical variable for groups is the expression and management of feelings. This addresses the effect conference mode may have on group member's expressions of feeling as well as the efficacy and methods the group uses to manage this factor. Teleconferencing does not appear to impede this process. Williams and Holloway (1974) reported that users did not feel deprived of social contact in their teleconferenced meetings. Users reported that teleconferencing inhibited the aggressive nature of meetings, but that it also inhibited their friendliness and liveliness. Apparently, the teleconferenced meeting is likely to be less intense for both positive and negative emotional factors. However, this research did not control for the fact that the users may conduct different types of meetings over the teleconferencing system than they do in face-to-face meetings.

The problem of equivalence of task between conference mode was controlled in the Weston et al. (1975) study. They reported that although the audio group reported the most uncertainty on several aspects of the conference on questionnaires (as compared to the teleconference and face-to-face groups) they expressed these feelings in the group much less frequently than did those in other groups. This inability or unwillingness to express uncertainties in audio appears to have left the uncertainties unresolved in these groups. Those in the face-to-face group were the most willing to ask for help, understanding or interpretation. Audioconferencing had the greatest amount of hostile communication, face-to-face had the second highest amount while teleconferencing had the least. This research supports the non-experimental findings of Williams and Holloway (1974) in terms of hostility in face-to-face vs. teleconferencing. It also provides additional information regarding audioconferencing. Those in audioconferencing felt the need to express hostility more frequently than those in the other conditions. Furthermore, despite the fact that the frequency of hostile messages was highest in the audio condition, these groups had fewer messages attempting to deal with this hostility than the teleconferencing group.

Group goals. Apparently, audioconferencing is unsatisfactory for the type of task employed in Weston et al. (1975) study. This is evidenced by the fact that the audioconference group made only half as many recommendations as did the other two groups, and that their recommendations were less complex than the recommendations of the other two groups. The previously cited study by Williams (1974) did not provide support for these findings. The three groups in his research were not significantly different in the number of problems generated concerning problems of travel in Britain. The apparent conflict may be a result of the complexity of the task to be performed. The task of the Williams (1974) study was to generate (brainstorm) problems of travel in Britain. Group members would then either second the proposal or dissent. The Weston et al. (1975) study involved a similar process at the first stage, but then subjects had to propose and come to consensus on solutions. Obviously the second task is more difficult and complex than the first.

A second factor which may explain the results was that the size of groups in the Weston et al. (1975) study was larger (n=6) than in the Williams (1974) study (n=4). Hence, even if the tasks were identical the problems of organizing more people may interact with conference mode to cause lesser productivity for the audioconference.

The above paragraphs indicate a need to investigate the relationships among group size, task complexity and conference mode. It may be that optimal group size may differ by conference mode. The problem of identifying those at the other node would dictate that the mode that would suffer most as a group size increased would be audioconferencing. Similarly, the channel with the narrowest bandwidth (audio) should suffer most as task complexity increases.

Summary. This section has investigated the literature on mediated conferencing in groups. It has specified critical variables essential to the survival of groups and summarized the results of research concerning the impact of conference mode on these variables. Research concerning the operation of communication mechanisms in each mode indicates that audioconferencing appears insufficient to maintain critical variables. The impact of task complexity and the complexities produced by differing group sizes were proposed as key environmental factors in determining the ability of mediated conferencing to maintain the critical variables necessary for the survival of groups.

V

LEVEL IV - THE ORGANIZATION

The principal distinction between the organizational level and those below it are the differences in amount of structure necessary to achieve the goals and objectives of the system. Farace et al. (1976) stressed that there are three basic functions which are served by communication which allow the achievement of these goals. These functions have been labeled: production, maintenance and innovation. The basic issue for organizational research and teleconferencing is how the introduction of teleconferencing alters the structure of communication designed to fulfill the functions of production, maintenance and innovation. Therefore, this section will analyze research with communication among organizational components as the system. It is assumed that unless this system is operating properly, the organization will fail to survive. Of course, other factors are important to the survival of the organization. An organization with a properly functioning communication system may fail to survive because it is not making a profit. Such elements may be analyzed as environmental factors which impinge upon the organizational communication system. Unless the communication system can adapt to situations imposed by other systems, the organization will not survive.

Four critical traits of communication systems within organizations have been proposed by Farace et al. (1976). The first of these is "degree of formalization." This concerns the amount of structure imposed by the organization on the paths which messages may take. The second is "direction of message flow." Such messages may be vertical or horizontal. Vertical messages may flow from the top down, or from the bottom up to higher levels in the organization. The third critical variable is labeled "initiation of messages." This dimension distinguishes between messages which are imposed vs. messages which are sought. The final critical variable is "information load." Information load refers to the proportion of resources expended on information processing compared with the processing of other matter/energy. Other matter/energy might refer to raw material processed into finished products, the conversion of one type of energy into another (electricity into steam), etc. Different theories dictate different optimal levels for each variable. Other perspectives suggest that optimal levels are contingent upon environmental factors and that there is no one optimal level. The veridicality of either approach has yet to be shown. Rather, most organizational communication is directed at determining ways in which these traits can be controlled by factors within the organization.

No research on teleconferencing has utilized the distinction between the communication functions of production, maintenance and innovation. It might be that teleconferencing is more appropriate for one function than another. It will be recalled that earlier in this work research by Christie (1974b) and Christie and Holloway (1974) indicated that telecommunication is the medium of choice when acquaintance is high and the content of the conference is not person oriented. These two conditions are most likely to be met during the transmission of messages aimed at production matters. Such communication is usually between individuals who are well acquainted and is principally concerned with non-relational matters. The type of communication least amenable to telecommunication appears to be communication which serves the maintenance function. Communication which serves this function is principally designed for the maintenance of an individual's self concept and the maintenance of interpersonal relationships with others in the organization (Berlo, 1969).

Communication designed to serve the function of innovation may be amenable to mediated conferencing. The innovation process is characterized by two subprocesses, creation of the innovation and adoption of the innovation. Teleconferencing may allow experts on research and development to meet jointly regardless of the distance between them. This may allow organizations to share the resources of several experts rather than have them compete for the experts as permanent employees. As far as adoption of the innovation, the research indicates the possibility that face-to-face communication may not be the most effective for persuasion. Research by Short (1972) indicated that in one instance persuasion was greater in audio-conferencing than in face-to-face or teleconferencing. Wall and Boyd (1971) found that a written message was more persuasive than the same message delivered via videotape or face-to-face. It may be that the communication system which is best for each function may differ. Further research concerning the effect of conference mode on communication by function appears necessary at this point.

Organizational structure. The physical structure of organizations can be changed using teleconferencing. Components of the organization whose element of exchange is information need not be physically proximate in order to fulfill their organizational functions. Almost all of the research reviewed by this author concerning the potential of telecommunication in terms of organizational structure has bypassed the application of teleconferencing. The research deals primarily with the ability of telecommunication to handle information which would otherwise be transferred via paper. Usually, the applications considered involve human-computer interaction. While this research is of importance, it is beyond the scope of this work. The difficulty of conducting organizational communication research is probably the reason for the scarcity of research on teleconferencing in organizations. No research has been brought to bear which assesses the impact of communication mode on the structure of communication in an organization. Of the four critical variables only one (information load) has received concern in organizational applications of teleconferencing.

Information load. It will be recalled that information load at the organizational level is determined by the proportion of all organizational resources expended on the transfer of information. Of concern here is the ability of teleconferencing to lower the proportion of organizational resources expended for information transfer. Can teleconferencing lower the cost of communication?

The extent to which teleconferencing can save time is of concern to organizations. The amount of time necessary to achieve face-to-face communication is of critical concern. Concomitantly, other travel related expenses such as hotels, meals etc. may be reduced considerably were a face-to-face conference to be substituted by a mediated conference. Williams and Holloway (1974) reported that users of the Bell Canada Conference System found that the system was convenient and time saving. Pye (1974) commented that the future for teleconferencing in organizations is dim. He asserted that while there is a need for face-to-face communication, the expense of teleconferencing systems precludes its widespread use. He asserted that travel will remain necessary for work, and envisioned people working at home or close to home for part of the week and traveling to meet others for the remainder of the week. Connell and Pye (1973) reported the results of a survey which asked members of an organization to assess the possible substitution of telephone or teleconferencing for their face-to-face communication. The conclusion of their research indicated that approximately one fourth of the meetings recorded could have been satisfactorily conducted via teleconferencing. Further research was conducted to determine the types of meetings for which teleconferencing is substitutable for face-to-face. The types of meetings were labeled: "negotiation", "conflict and negotiation", and "forming impressions of other." The extent to which these types of meetings are conducted by an organization may determine the feasibility of teleconferencing for the organization.

Polishuk (1975) reported on several applications of mediated communication systems and reported findings which generally favor telecommunication systems over face-to-face communication in terms of cost. The NASA-Apollo system connected eleven locations which could handle up to 50 people each. The system had full audio capability and allowed the transmission of hard copy material. It was estimated that every dollar spent on building and operating the system saved three to five dollars in transportation costs. The Metropolitan Regional Council Television System links ten state and local governments in New York, New Jersey and Connecticut. The system provides full audio and video capabilities. The author reported that a rough comparison of the system with the costs of face-to-face communicaiton suggested that the per meeting cost is less for the teleconferencing system. Dow Chemical installed a teleconferencing system headquarters in Michigan and its manufacturing division in Texas. In 1973 over 3,500 trips were made between the two locations by Dow employees resulting in a travel cost of approximately 1.4 million dollars. The cost of the system's installation was $300,000. Transmission costs were $2,000.00 per hour. Previously, two days were required for a one hour meeting. The company president reported that the system provides a large reduction in the number of man-hours spent traveling. Specific cost comparisons were not provided.

Kohl, Newman and Tomey (1975) reported on the results of an experimental application of audioconferencing between two executive offices of a Connecticut bank. The researchers report that almost all participants (N=21) used the conference facilities for at least 50% of their previous face-to-face meetings and that over one-third substituted audioconferencing for 80% or more of their face-to-face meetings. Almost all system users reported that the meetings were as effective as face-to-face meetings and that the meetings were 30-35% shorter than prior face-to-face meetings. A short term cost analysis indicated that the bank was saving approximately $500.00 a month using the system. After completion of the experiment the bank purchased the system so that its benefits would not be lost.

Apparently, mediated conferencing systems are becoming adopted by organizations which already have geographically remote locations. It would be anticipated that as information about mediated conferencing systems spreads, more organizations would consider adopting the innovation. There is little evidence to indicate that organizations are planning to decentralize due to the availability of teleconferencing. At present, only organizations which are already dispersed have adopted mediated conferencing systems.

The research to date indicates that audioconferencing appears to decrease the amount of resources necessary to transfer information in already dispersed organizations. There is not sufficient evidence to indicate that teleconferencing would have a similar effect. More research is needed which assesses the impact of conference mode on the costs of information transfer.

If mediated conferencing is shown to be cost effective, the question which arises is "What is done with the savings in time and money?" How are the savings realized in terms of increased productivity etc.? It is likely that mediated conferencing systems allow conferences to occur with greater frequency than before. Hence, the savings in communication costs per meeting might be nullified by an increase in the number of meetings. This in turn may result in an increase or decrease in the productivity of the organization. On the one hand, the increase in meetings may allow the organization to become better coordinated and become more effective. On the other hand, the additional meetings may not be necessary. The effort spent in communicating might be better spent elsewhere. Hence, research on mediated conferencing in organizations should examine more than the dollar saving per meeting. It might be useful to compare meetings which would have occurred without the conferencing system to meetings which result due to the availability of a mediated conferencing system.

Summary. Research on organizational communication and mediated conferencing systems is scarce at this time. More research is necessary in order to determine the impact of conferencing mode on the critical variables degree of formalization, direction of message flow, message initiation and information load. From there it may also be possible to determine the impact of conference mode on the ability of communication mechanisms to control the levels of these critical variables.

VI

EVALUATING FUNCTIONAL ANALYSIS FOR TELECOMMUNICATIONS RESEARCH

This work attempted to investigate the impacts of mediated conferencing systems on four levels of communication; the individual, the dyad, the group and the organization. Within each level functional analysis has been used as a guide for identifying critical variables and mechanisms essential for the system to survive. While functional analysis clearly specifies the relationship between mechanism and critical variable, it is often very difficult to specify which is a critical variable and which is a mechanism. Often, theory dictates this relationship. Unfortunately, theory at this time is not sufficiently developed. While this is a serious problem, it is no more a problem of functional analysis than any other type of causal explanation.

Empirical evidence is often useful in specifying the relationship between critical variable and maintenance mechanism. The majority of empirical evidence on mediated conferencing systems is of no assistance in this regard. Some direction has been provided by empirical work in nonmediated communication. For example, considerable effort has been focused on the variable "cohesiveness." Theoretic relationships have been specified. Empirical evidence indicates that there are mechanisms which respond when cohesiveness is too high or too low. Unfortunately, no research has examined whether mediated conferencing systems enhance or retard the ability of mechanisms to maintain the necessary levels of this variable.

The research on mediated conferencing that is available to date has not addressed the problem of the impact of conference mode on the relationship between mechanism and critical variable. The research has been much more basic. The question assessed most often is the relative impact of conference mode on critical variables. This provides data on whether conference mode causes different levels of the critical variable, but not how these levels are achieved or why mode of conference has impact. The functional analysis in this paper provides some guidance for this next series of important questions.

Research which assesses the impact of conference mode is still necessary in order to determine the contexts in which mode alters the nature of conferences. However, this is only a partial answer to the question of the effects of mediated conferencing at each level. If mechanisms exist which maintain the levels of critical variables, mediated conferencing systems may not alter the levels of critical variables but may alter the mechanisms which maintain critical levels. New mechanisms may arise which have not been of consequence before. Research is needed which is concerned with the mechanism-critical variable relationship. If it is found that previous mechanisms are no longer functioning, but the system is surviving there is an indication that new mechanisms have emerged or old ones have become more effective. Such efforts will allow mediated communication research to take greater advantage of the large body of knowledge accumulated by those interested in interpersonal communication. Hopefully this will lead to a more rapid understanding of both mediated and nonmediated communication.

TABULAR SUMMARY

The following table outlines the discussions and conclusions of this analysis:

Level I - The individual.

Maintenance Mechanisms	Critical Variable	Findings	Critical Research and Theoretic Issues
Information Seeking			
Coping Mechanisms			
	Information Load	For the same task, information load lowest for audioconferencing.	The relationships between the critical variable and maintenance mechanisms.

Level II - The dyad.

Maintenance Mechanisms	Critical Variables	Findings	Critical Research and Theoretic Issues
Coorientation on communication rules.		Changes in communication rules have been observed between modes.	The relationships between the maintenance mechanisms and the critical variables for tasks of differing complexity.
Coorientation on interpersonal perceptions.		Interpersonal perceptions of opinion are least accurate in audioconferencing.	
			The effect of conference mode upon communication rules and interpersonal perceptions.
			The effect of conference mode upon coorientation on communication rules and interpersonal perceptions.
	Attitude toward conference mode.	Teleconferencing lowest in privacy.	The effect of attitude on selection of mode.
		Audioconferencing lowest in aestheticism and evaluation.	The effect of utilization of conference mode on attitude toward mode.

Level II - The dyad (cont'd)

Maintenance Mechanisms	Critical Variables	Findings	Critical Research and Theoretic Issues
		Selection of conference mode depends on four factors: person orientation of meeting, participants acquaintance level, evaluation of mode and travel time.	The ability of these four factors to predict utilization of mode, and the identification of other factors.
			Specification of the environmental conditions under which attitude toward mode is critical.
	Attitude toward the person.	In situations of high conflict, the evaluation of the other is higher in audio than face-to-face.	The effect of selection and utilization of conference mode upon interpersonal attitudes.
			The effect of interpersonal attitude and travel time on selection of mode.
			Specification of the environmental conditions under which interpersonal attitudes are critical.
	Attitude toward the dyad.	----	The effect of attitude toward the dyad on selection and utilization of mode.
			The effect of selection and utilization of mode on attitude toward the dyad.
			Specification of the environmental conditions under which attitude toward the dyad is a critical variable.
	Coordination of Behavior.	Persuasion more effective in audioconferencing.	Empirical evaluation of proposed explanations for findings to date.

Level II - The dyad (cont'd)

Maintenance Mechanisms	Critical Variables	Findings	Critical Research and Theoretic Findings
		Cooperation lowest in audioconferencing.	
			Assessment of the relationships between maintenance mechanisms and critical variables.

Level III - The group.

Maintenance Mechanisms	Critical Variables	Findings	Critical Research and Theoretic Findings
Task communication		Time spent organizing greatest in audioconferencing, least in face-to-face. Organizing messages aimed at other node most in audioconferencing, least in face-to-face.	The effect of task complexity and group size on achievement of task.
Socio-emotional communication		Hostility greatest in audioconferencing. Hostility for this group almost always aimed at other node. Fewest attempts to manage hostility in audioconferencing.	The effect of task complexity and group size on socio-emotional communication.
	Cohesiveness	Audioconferencing fosters coalitions at either node. Weaker coalitions have been found for teleconferencing.	The desirability of coalition formation.
			The effect of task complexity and group size on cohesiveness.
	Adaptation	----	The effect of conference mode on adaptability. Theoretic explanation for observed effects of conference mode availability or utilization on adaptation. Evaluation of the theoretic explanation.

Level III - The group (cont'd)

Maintenance Mechanisms	Critical Variables	Findings	Critical Research and Theoretic Issues
	Instrumental Control	More difficult to achieve in audioconferencing than teleconferencing. More difficult to achieve in teleconferencing than in face-to-face. Telecommunicated meetings more prone to dictatorial control than face-to-face meetings (may be a result of sampling error).	The effect of conference mode on amount of instrumental control. The effect of conference mode on the structure of instrumental control communication The effect of conference mode on the relationships between maintenance mechanisms and instrumental control.
	Expression and Management of Feelings	Greater feelings of hostility and expression of hostility in audioconferencing. Lower desire to resolve conflicts in audioconferencing.	Explanation for the observed effects. Evaluation of the explanation.

Level IV - The organization.

Maintenance Mechanisms	Critical Variables	Findings	Critical Research and Theoretic Issues
	Information Load	Audioconferencing systems substantially reduce the cost of communication.	Cost-benefit analysis of conference modes.
	Degree of Formalization	----	The effect of the availability and utilization of telecommunication on the degree of formalization.
	Direction of Message Flow	----	The impact of telecommunicated conferencing on direction of message flow.

Level IV - The organization (cont'd)

Maintenance Mechanisms	Critical Variables	Findings	Critical Research and Theoretic Issues
	Initiation of Messages	----	The effect of telecommunicated conferencing on message initiation.
			The suitability of each conference mode for communication designed to fulfill the production, maintenance or innovation functions.
			The impact of conference mode on organizational structure.
			Specification of maintenance mechanisms for critical organizational communication variables.

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AUDIO/VISUAL DESIGN CONSIDERATIONS IN TELECONFERENCING

Alfonse Acampora
Communications Systems Research
RCA Laboratories
Princeton, NJ 08540

INTRODUCTION

Although the telephone has become an indispensable tool in the business world, it has apparently not replaced the need for face-to-face meetings. Video conferencing presents a viable alternative to this face-to-face contact. With proper design considerations, it should be possible to enable a meeting, with remote participants, to proceed as if all the attendees were co-located.

The design considerations bear strongly on the areas of:

1. user requirements,
2. human engineering,
3. cost considerations
    a) bandwidth requirements,
    b) studio and transmission equipment.

Past research has dealt primarily with the user requirements and human interface factors This paper gives a brief overview of video display and transmission techniques and describes two new video display multiplexing techniques. These techniques reduce transmission bandwidths and terminal costs, and also address the human engineering aspects. With regard to the latter, the systems described provide good facial definition, views of all the remote participants, and the capability to view graphical material and presenters simultaneously. These are necessary conditions to give the conferees as many degrees of freedom as would ordinarily accrue in face-to-face meetings.

The methods of transmission and display fall into two categories:

1. scene interleaving and separation -- a form of space/time division multiplexing, and
2. frame interleaving and separation -- a time division multiplexing, analogous to field interleaving but capitalizing on improved resolution.

BASIC METHODS OF VIDEO GENERATION AND DISPLAY

Although the means of video generation and display (i.e., studio techniques) and transmission are interrelated, for teleconferencing, there is more latitude in the former. That is to say, video teleconferencing can take advantage of trade-offs (within acceptable tolerance

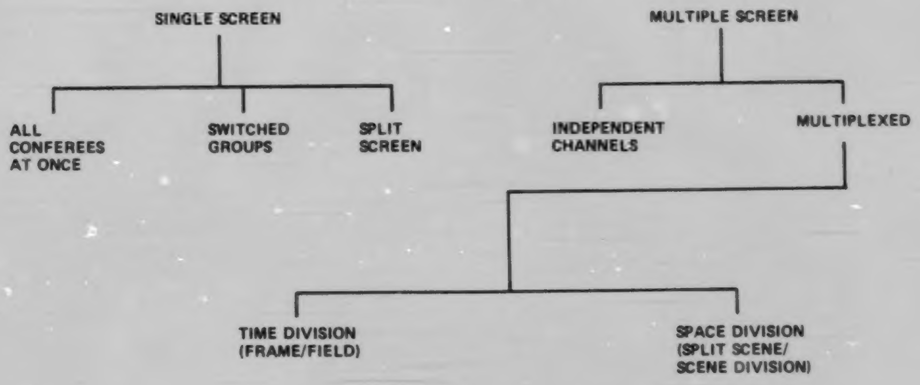

Figure 1. Picture Display Methods.

limits) between motion rendition, resolution, received signal-to-noise, and other special visual effects which the rigorous specifications of broadcast television, for example, would not otherwise allow.

These trade-offs permit simpler, more cost effective video systems which, as a result, are better tailored to teleconferencing use. As noted, the methods of picture display can increase the use of the channel, as well as bear strongly on the factors of eye contact and expression, and the feeling of presence which is important for successful remote conferencing.

The choice of video generation and display mechanisms suggests a tree as shown in Figure 1. The basic starting premises are single screen and multiple screen displays. The following text traces through the tree to analyze the impact of the display upon the video generation technique, and discusses the various advantages and disadvantages.

Single Screen Technique

If the receiver site is restricted to have only a single display device, then the practical methods to accommodate this requirement are those of fixed group, switched groups, and split screen. These will be discussed next.

Fixed Group. Within the restrictions of single monitor screen at the receiver, the simplest, most straightforward manner is to display all the conferees in one field of view. However, past experiences in teleconferencing have shown that facial definition and expression are subjectively important factors in the successful acceptance of a teleconferencing system. In fact, more than three or four adjacently seated conferees exceeds the limits of facial definition and eye contact. Therefore, the single view display would only be practical in conferences of four or less people, and would seem to be quite restrictive in this regard.

Switched Groups. One method of overcoming some of the previously noted disadvantages is to have several cameras focused on small groups of conferees. Preferably, the sub-group size would be limited to three or less persons such that a conference of nine people would have three cameras. The scene to be transmitted could be selected by an operator, although most of the existing experimental conference systems use voice controlled switching. That is, the camera choice is automatically governed by the audio level emanating from a particular group. The philosophy of voice switching has many drawbacks:

1. visual disturbances of switching,
2. threshold settings and appropriate hang-over times,
3. viewer confusion due to rapid repeated switching during exchanges between people from different groups,
4. inadvertant switching (coughing, aside conversations),
5. system indecisions due to simultaneous talkers and silence.

Split Screen. A technique, which is a good compromise between the previous fixed and switched groups, is the split screen or scene division technique. Calculations have shown that for a field of view of three people sitting side by side, somewhat less than half the scene height will contain useful information, that is, the table top and the conferees themselves. The rest of the scene will be the table bottom and the wall. Therefore, it is reasonable to assume that a composite video signal can be composed of three conferees in the top half of the field, and three other conferees in the bottom half of the field, as shown in the upper portion of Figure 2. There is an intrinsic subjective difficulty in this approach. With a single monitor, the displayed image must be left composed, in which case the remote conferees will appear to be sitting in a tiered arrangement. However, this method allows the benefits of continuous view with good facial resolution of six to eight conferees, without the confusion of camera switching.

The natural restriction of six to eight total active participants is reasonable since statistics show that only 20% of conferences have more than six people, and only 10% have more than eight active people.

Multiple Screen Techniques

Allowing more than one monitor at the receive side leads to a greater variety of techniques for conferee image presentation. The caveat here is that past experimentation has shown that viewing more than two monitors is disturbing and is unacceptable in terms of viewing direction and eye contact maintenance. Because of this, the discussion will be restricted to techniques using two monitors.

The ideal solution to practically all of the previous single screen problems is to partition the conferees into subgroups (typically three conferees in each group) and transmit each group image continually. Of course, even for the minimal case of two cameras, independent channels are extravagant in terms of transmission bandwidth. However, there are multiplexing techniques which utilize field interpolation and/or frame repeat mechanisms which give the appearance of multiple channel signal occupancy while actually only using the bandwidth of a single TV channel. Techniques for doing this are discussed next.

Field/Frame Division. A multiplexing technique for consideration is the time division of fields, or frames, from two independent locked video sources.

Previous programs at RCA Laboratories have evaluated field interleaved systems. In these systems, the odd fields from one source are time multiplexed (alternated) with the even fields of a second (two cameras focused on two conferee groups, for example). At the receiver, the fields are separated, and the missing fields are interpolated using field storage and comb filtering. This procedure results in some loss of both motion rendition and resolution. Furthermore, the equipment is relatively expensive.

For teleconferencing use, motion rendition (seated people) is secondary in importance to resolution (charts, graphics, etc.). Therefore, it seems that frame multiplexing is more appropriate for teleconferencing. The concept is that alternate frames from two sources are time multiplexed. Since the frames are each fully interlaced, then the maximum obtainable resolution is available. The recovery of the missing frames can either be done by interpolation (with suitable storage) or simple repetition of the previous frame. Since this area had been relatively undeveloped, a prototype frame interleaved system with simple frame repeat was developed for evaluation. The implementation is discussed in a later section.

Scene Division. As noted in the previous discussion of split screen transmission, the subjective difficulty with one monitor was the necessity to leave the scene in composite form at the receiver. However, with two monitors, it is possible to divide the composed video into the individual scenes for independent display. In this case (referring to Figure 2), the scenes can be simply separated, appearing on the upper and lower halves of two monitors, or the scenes can be suitably shifted down and up, respectively, to provide center screen luminance, and indeed give the impression of side-by-side seated conference participants. Since the methods of combining two scenes in split screen format are well understood, the techniques of separating and shifting such a split scene at the receiver were undertaken, and the results of the implementation are discussed in the following sections.

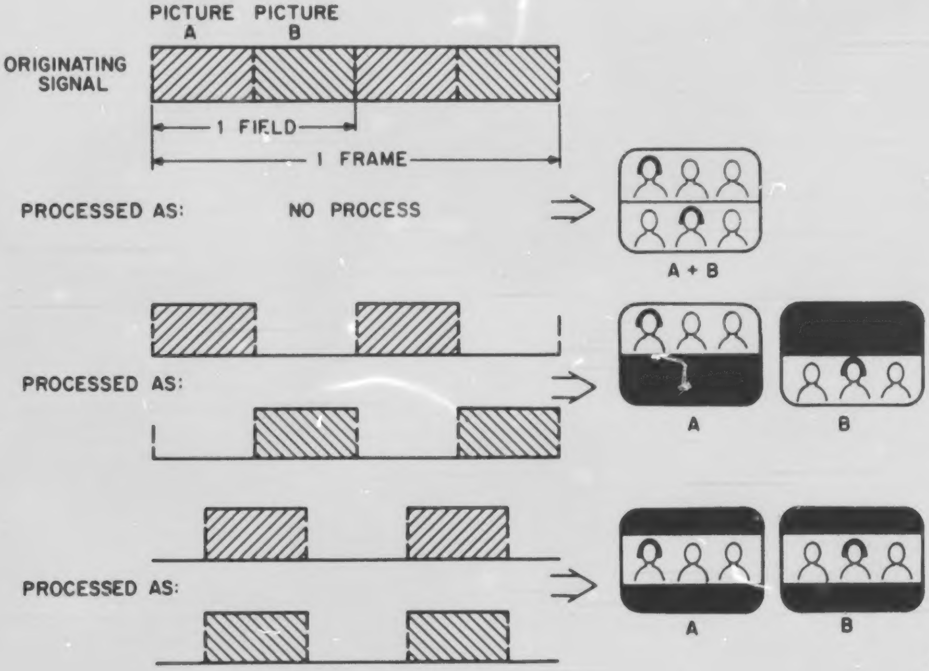

Figure 2. Scene Separation Techniques.

Graphics. Although the discussion so far has concentrated on the visual presentation of conference participants, a significant part of group meetings involves graphic presentations of charts and other visual aids. In the single screen cases, the graphic visuals must of necessity replace the conferee images during presentation. However, with multiplexing techniques, it is possible to interleave the graphics video with that of the participants. It is enjoyable to consider marriage of field/frame interleaving of graphics and participants with a scene division of the conferees such that all the remote group and the graphics could be viewed simultaneously -- which is most like face-to-face meetings.

However, previous experimentation with field interleaved systems showed that the jaggedness of lines (especially diagonal), due to the interpolation process, was unacceptable. These points of view imparted further impetus toward the parallel development of scene division and frame multiplex techniques described in this report.

VIDEO TRANSMISSION METHODS

Although this paper is not concerned with developments of new transmission techniques, it is important to define the applicability and impact of the video composition and picture display techniques on existing or near term video transmission systems.

Previous demonstrations in a joint RCA Laboratories, RCA Americom program have shown the efficacy of transmitting four simplex broadcast television channels via an RCA Americom satellite. This was done using dual carriers (offset from transponder channel center). Each carrier was modulated with two video signals processed by a field interleaved system. These video signals can be two full screen participant views (appropriately replaced by graphics as needed) or a split screen (with or without subsequent scene splitting) and simultaneous graphics -- in fact, any of the previous video generation means. Full duplex conference operation can be obtained by uplinking the carriers from the two participating sites.

The point is that the display methods previously discussed can be used on both standard and special satellite channels.

SCENE DIVISION SYSTEM

In order to better understand the requirements for a scene division system, especially the scene splitting and shifting aspects, a prototype scene division system was breadboarded and tested in the lab.

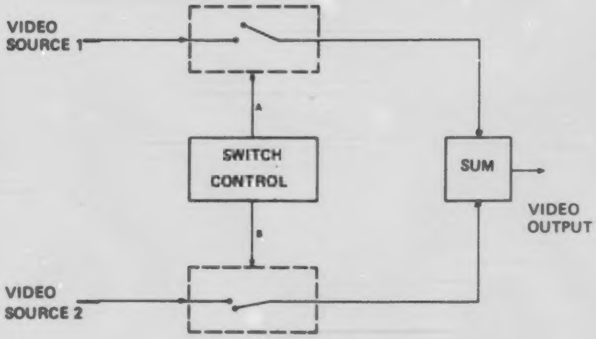

Figure 3. Scene Combiner Block Diagram.

Scene Combiner Block Diagram

The block diagram of the transmit portion of a scene splitter is shown in Figure 3. In principle, two video sources feed independent analog switches which are controlled by complimentary switching signals. The resultant switch outputs are combined (linearly added). The switch control signal generation is shown in Figure 4. At the beginning of a vertical interval the A control line becomes high. After a one-half field interval (about 8.3 milliseconds) the A control goes low while the B control simultaneously goes high. At the beginning of the next vertical interval, B control goes low, and the process repeats. The result, from summing after the switches is a composite video signal where half the field belongs to source A, and the other half to source B. The necessary requirement for combining is that the two video signals are synchronized and correctly

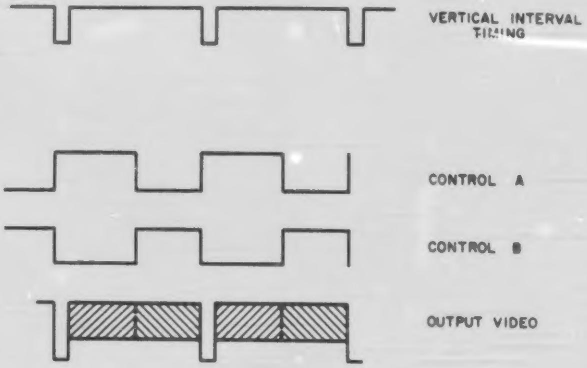

Figure 4. Switch Control Signals.

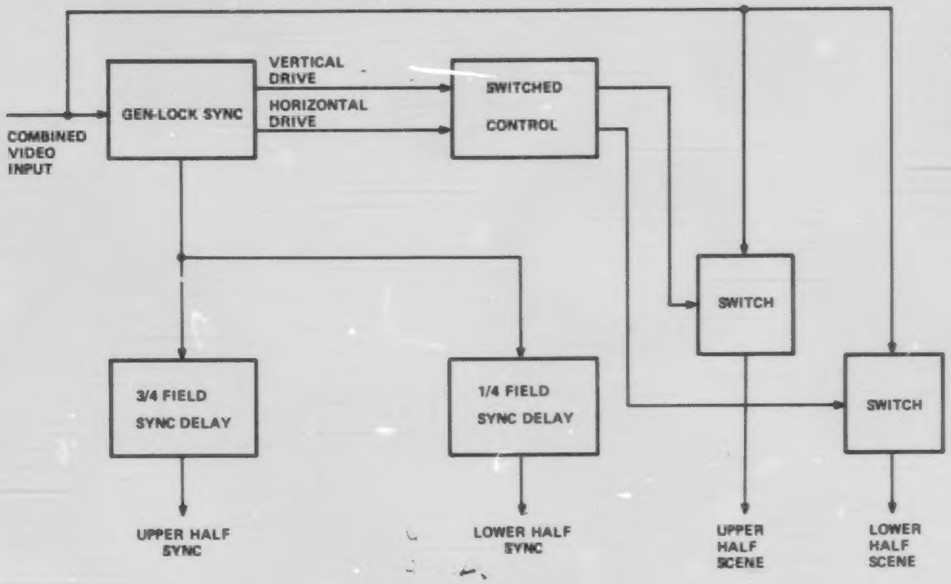
COMBINED VIDEO INPUT
GEN-LOCK SYNC
VERTICAL DRIVE
HORIZONTAL DRIVE
SWITCHED CONTROL
SWITCH
SWITCH
3/4 FIELD SYNC DELAY
1/4 FIELD SYNC DELAY
UPPER HALF SYNC
LOWER HALF SYNC
UPPER HALF SCENE
LOWER HALF SCENE

Figure 5. Scene Division Block Diagram.

phased with respect to the vertical and horizontal intervals. In addition, color burst phase lock (in the case of color signals) is also mandatory to assure proper reception.

Scene Divider

The receiver block diagram is shown in Figure 5. There are two major functions of the receive system. One is to separete (by switching) the video in the top half of each field from the video in the bottom half, as shown pictorially in Figure 6. The other function is to generate two composite sync signals, each shifted from the incoming sync by 1/4 and 3/4 field, respectively. This results in sync timing, relative to video signals, as shown in Figure 6 such that each half picture will occupy the center of a normal TV raster.

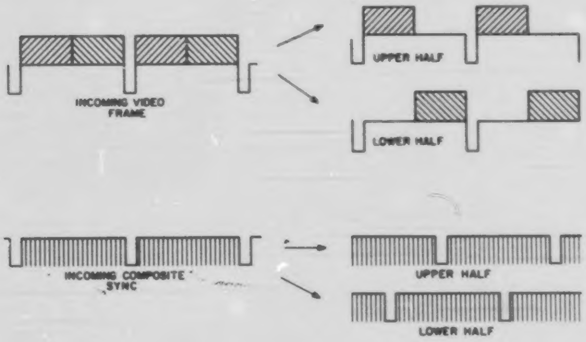
INCOMING VIDEO FRAME
UPPER HALF
LOWER HALF
INCOMING COMPOSITE SYNC
UPPER HALF
LOWER HALF

Figure 6. Video Separation and Sync Shifting.

Theory of Operation

In principle, for monochrome video, it suffices to strip and separate sync from the incoming composite video, re-generate shifted sync for 1/4 and 3/4 field presentations, and use these signals in display monitors capable of accepting external sync. In this case, the video supplied to these monitors is just those field halves which pertain to the originating sources (see Figure 6). However, for the case of color signals, there are significant problems which must be overcome. First, because there is no color burst reference in the long blanking interval associated with the video signals of the form shown in Figure 6, the resulting displayed picture exhibits severe chroma distortion for the first 10 to 20 active lines (depending on monitor phase lock loop pull in time). In the conventional full raster video, this phenomenon takes place in the vertical interval and is not observable. However, in the split scene case, the scene starts 1/4 of the way into the raster, and chroma perturbations are quite discernible.

Second is the fact that color monitors with external synchronization capabilities are expensive. For teleconferencing, it is desirable to use standard consumer product monitors which generally do not have external drive capabilities.

From the above reasoning, it was concluded that a TV signal of the form shown as upper and lower in Figure 6 should be generated, but the long vertical blanking intervals associated with shifted split scenes should be black burst signals when color signals are used.

FRAME DIVISION SYSTEM

The Frame Division System, discussed in the following sections, is analogous to field division systems which had been previously evaluated at RCA Laboratories. In the latter case, alternate fields from two synchronized video sources are multiplexed onto a common channel which supports the odd fields from one source interleaved with the even fields of the other. The recovery process incorporated a digitization and storage of the incoming field so that the missing fields from any one source at the receiver could be linearly interpolated - providing a complete interlaced frame. The interpolation process resulted in some loss in resolution - especially in the piecewise approximation of the otherwise straight lines and smooth curves - and barely perceptible motion rendition loss for the average scene. Moreover, a precise phase relationship is required between the color bursts and sync tips of the two sources.

Specifically, for video teleconferencing, motion rendition is perhaps a secondary consideration (seated individuals) compared to resolution (charts, etc.). Normal TV resolution of still frame graphic displays can certainly be preserved in a multiplexed system by considering frame rather than field interleaving. Moreover, within some tolerable limits of motion loss, it is considered quite feasible to provide a simple frame store and repeat mechanism to account for the missing frames. In order to ascertain some of the requirements of frame store and repeat, a prototype system was developed.

System Concept

The concept is shown in Figure 7. It is assumed that the video signals to be multiplexed are synchronous either by virtue of utilizing a common sync generator or other synchronizing means, such as a frame synchronizer.

On the transmit end, the system contains the following basic elements:

- standard video sources like TV cameras and synchronization means to provide the various video programs to be transmitted with necessary identical synchronizing and blanking signals;
- a multiplexing switch whose contact closures are controlled by signals generated locally and derived also from the basic synchronizing source;
- auxiliary devices like amplifiers, level shifters, signal extractors, and signal strippers.

The repetition rate of the switching pulses is synchronized with the frame frequency.

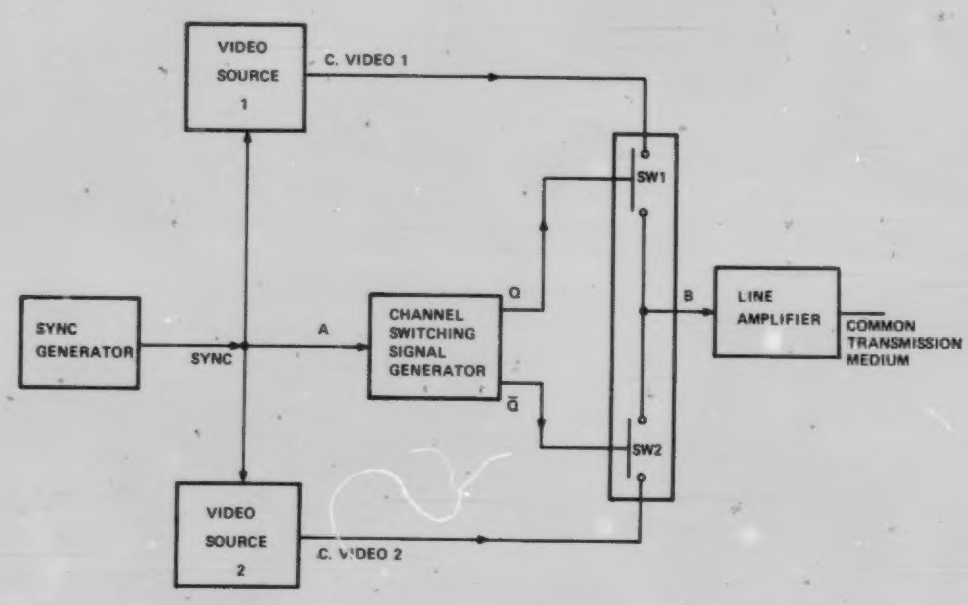

Figure 7. Frame Combining Concept.

The width of these pulses is equal to one frame time interval.

Video information from both sources are applied continuously to the input of switch 1 (SW 1) and switch 2 (SW 2), respectively. The outputs of both switches are tied together. During the time interval of the first frame, the pulse appearing at Q will cause SW 1 closure, allowing Video 1 to reach the input of the line amplifier, hence the common transmission line. At the same time, the polarity of the pulse at $\overline{Q}$ will keep SW 2 open keeping the source 2 video from the line amplifier. During the next frame time interval, the polarity of the pulses at Q and $\overline{Q}$ are reversed and source 2 video in turn is allowed to reach the common transmission line while the path of the source 1 video is opened. This arrangement allows a train of alternating video frames to appear at the input of the common transmission medium.

The receive end or demultiplexer of the system (see Figure 8) consists of the following basic elements:

- demultiplexing switch (SW 1 and SW 4) which selects the video program and directs it to the appropriate storage device and monitor;
- storage devices capable of storing a full frame of video;
- two additional switches (SW 2 and SW 3, SW 5 and SW 6) for each channel controlling the video fed to the monitor. These switches determine whether video direct from the line or from the output of an appropriate storage device will be applied to the input of the display;
- a channel switching generator derived and controlled from the sync information of the multiplexed composite video.

A simplified functional block diagram is shown on Figure 8.

The received multiplexed signal consisting of a train of alternating video frames is applied to a sync extracting circuit. The separated odd field vertical is used to synchronize the channel switch signal generator. The repetition rate of these pulses and their duration are the same as their counterparts in the transmitter-multiplexer.

During the first frame interval, the incoming signal through the closed contacts of SW 1 is applied to the input of the channel 1 storage device and simultaneously, for the duration of one frame, is fed to the input of the first channel monitor through the closed contacts of SW 2. The leading edge of the channel switching pulse generates the write command.

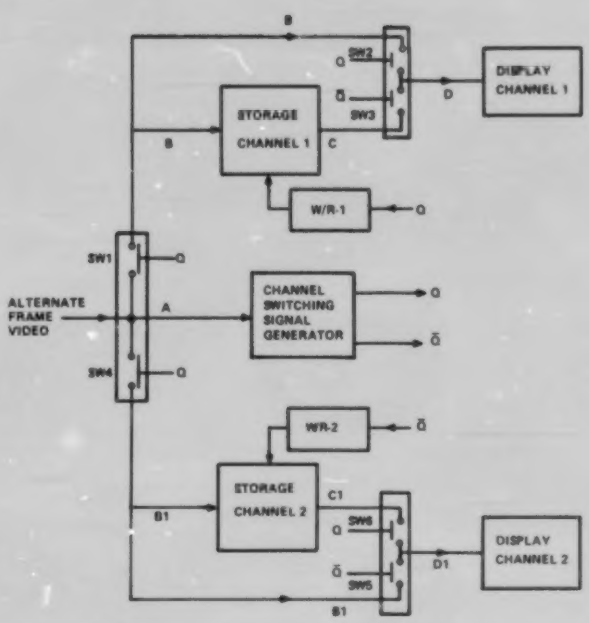

Figure 8. Frame Separation Concept.

At the time interval of the next frame, switches SW 1 and SW 2 are open, preventing the signal present at the input of the demultiplexer switch from reaching the storage device and the monitor of channel 1, while the closed contacts of switches SW 4 and SW 5 establish a path for the multiplexed signal to the input of storage and display of channel 2. The leading edge of the switching pulse generates the write command applied to the storage device of channel 2.

During the time interval of frame 2, when switches SW 1 and SW 2 are open, switch SW 3 is closed allowing the frame 1 video previously stored to reach the input of channel 1 monitor.

In a similar fashion the polarity of the pulse applied to the control input of SW 6 is such that the stored signal of frame 2 reaches the input of channel 2 monitor simultaneously with opening of switches SW 4 and SW 5. In this way, each video source can be recovered by a process wherein alternate frames are real-time updates, and the intervening frames are repeats of the previous frame.

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Based upon the results of past research, video teleconferencing has its own special requirements - namely, good facial definition of participants, high resolution for graphics, with relative de-emphasis on motion rendition.

Toward these ends, split scene techniques maximize the number of conferees without the attendant problems of voice switching. Subjective tests have shown the efficacy of this method in presenting a continuous view of up to eight individuals.

The subjective response of a small sample group indicates that splitting the scene onto two monitors is more desirable than leaving the split scene composed on one monitor, and that in-line shifting the scenes were optimum. In addition, masking upper and lower quarters of the blanked raster obviated the oftentimes mistaken impression of monitor malfunction.

In order to successfully split into two monitors, the following requirements result:

1. for monochrome split scene, the recovery of each half of the video field is as simple as blanking out the undesired half picture, and developing a shifted composite sync - either 1/4 or 3/4 field delay (depending on which half picture was desired) - and utilizing rather common externally driven monochrome monitors;
2. for the full color case, even with the luxury of externally driven color monitors, the unwanted picture regions could not be simply blanked, but rather had to contain color burst information (e.g., black burst);
3. the phase relationships of the inserted black burst, and the color bursts of the desired video, as well as the phase relationships of the sync tips were critical to prevent objectionable chrominance distortions and horizontal tearing or flagging.

The implementation of scene division can be made by minor modifications of off-the-shelf video processing systems and presents a "normal" display of adjacently seated participants.

Split scene, and other forms of video (e.g., graphics), can be multiplexed on a field or frame basis. In particular, frame multiplexing offers better resolution when compared to field interleaving, although the motion rendition is poorer. Subjective tests show that a one frame in three update is workable. Lip synchronization is the predominant adverse effect if more than three sources are multiplexed.

Although a magnetic disk was used in the research, digital storage techniques would provide better performance. This is achieved at higher cost, a factor which is likely to change within several years.

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"CONTINUOUS PRESENCE"
Video Conferencing at 1.5-6Mb/sec

by

A. B. Larsen and E. F. Brown
Bell Laboratories
Holmdel, New Jersey 07733

ABSTRACT

The typical video conference involves more people than can be effectively fitted into a single picture. Voice-Switching (VS) attempts to overcome this difficulty by transmitting only the person speaking (or graphics). Continuous Presence (CP) solves this problem by presenting simultaneously multiple (three) full motion pictures of all conferees (plus graphics). Earlier behavioral studies comparing analog VS and CP Systems showed a significant preference for this CP System.

VS signals processed by conditional replenishment techniques provide acceptable pictures at transmission rates of 3 to 6 Mb/sec. Real-time simulations incorporating the improved processing described in this paper show that CP signals can be transmitted at comparable bit rates. These improvements include new means for temporal filtering and dynamic division of the transmission channel capacity among the pictures and provide digital CP system performance that exceeds that of its analog counterpart.

I. INTRODUCTION

It is hypothesized that the more "open" a teleconferencing system, the closer it will resemble the feel of a face-to-face conference and the closer it will match the physical and psychological needs of the participants. To test this "openness" requirement, an experimental "Continuous Presence" system,[1] was set up between the Holmdel Laboratory and Murray Hill Laboratories. This transmitted the near-full size head and shoulders images three of sets of participants plus medium resolution graphics for simultaneous and dynamic display at the far end. This system was built to operate in parallel with an existing Voice-Switched Video Conferencing System[2] where only the person speaking or graphics was visible at the far end. A standard 4.0 MHz analog channel was used for both systems. A subjective and objective comparison of the two systems was then carried out by Brown,[3,4] et al. This study showed the subjects overwhelmingly preferred the "Continuous Presence" system and achieved more accurate solutions to the assigned problems when using it.

For reasons of economy, video conference signals are expected to be transmitted digitally, and both simulators(5) and actual codecs(8) have been built to optimize and evaluate the subjective quality of voice-switched digital teleconferencing services at various bit rates. Digital processing utilizing conditional replenishment techniques is used to reduce the transmitted bit rate to 3-6 Mb/sec. Although behavioral studies had shown the clear superiority of continuous presence over voice switching in the analog domain, the lack of a digital simulation of continuous presence prevented any evaluation of the two formats under the more practical constraint of equal bit rates. This paper describes such a digital simulation of a continuous presence system, how it was optimized, and the results obtained from it.

II. BACKGROUND

A. Analog Continuous Presence

A simplified block diagram of the analog "Continuous Presence" (CP) system is shown in Fig. 1. The objective was to multiplex the three "people" signals plus the graphics signal over a common 4.0 MHz channel. The graphics camera operated at standard broadcast rates while the three "people" cameras had their vertical scanning frequency marginally reduced to provide sequentially scanned 263 line pictures. Normally, every third frame of each camera was transmitted, thus the picture update rate was 20 hertz. At the receiver, these pictures were stored in analog frame memories and the display was refreshed at a 60 hertz rate to avoid flicker. However, due to the low update rate, the display exhibited considerable jerkiness with rapid motion. A graphics frame was transmitted by "stealing" one frame from each of the two outer people pictures; this was limited to occurring every other frame. Thus, the maximum graphics update rate was 10 frames/second, which also became the minimum people picture update rate. The 10 hertz rate for graphics proved to be adequate for hand-written messages, as well as for sending a series of drawings, pointing, etc.

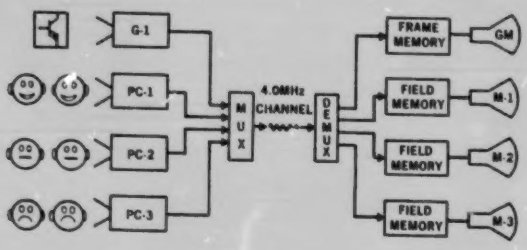

Figure 1. Block diagram of analog transmission version of Continuous Presence video conferencing system, where three "people" signals and a graphics signal are multiplexed over a 4.0 Mhz channel at reduced temporal rates for dynamic display at far end. The received signals are stored to allow a 60 Hz refresh rate.

B. Basic Conditional Replenishment System Simulator

In order to achieve reasonable picture quality at the relatively low bit rate that economics dictates for video conferencing, conditional replenishing techniques must be used to reduce the bit rate. A simplified block diagram of the simulator for a conditional replenishment system is shown in Fig. 2; also required but not shown in this diagram is a PDP-11/40 computer, which is used to control the operation of the conditional replenishment system as a function of buffer occupancy and bit generation rate. With conditional replenishment systems, the picture is broken into two major parts, i.e., stationary (background) areas and moving areas. Information is transmitted only about areas that change. An actual system requires frame memories at both transmitter and receiver. With error-free transmission the two frame memories would contain the same information. For simulation purposes, the contents of the transmitter frame memory are used to represent the equivalent received picture. The moving areas of the picture are determined by examining frame-to-frame differences, eliminating noise to some extent, and bridging small gaps where no change is detected in order to increase addressing

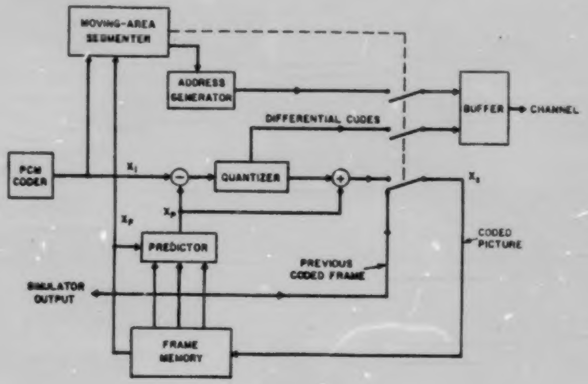

Figure 2. Block diagram of the basic components of a conditional replenishment coder simulator. The moving-Area Segmenter uses the frame difference signal to segment the picture into moving and nonmoving areas. Nonmoving areas are repeated to form coded signal Xc. In moving areas input signal Xi is subtracted from predicted signal Xp. The difference is used to form coded signal Xc. It is also coded and fed to the Buffer. A computer (not shown) monitors the buffer queue length to control the coder's operating mode and thus its bit generation rate.

efficiency. Frame-to-frame and line-to-line DPCM techniques are used to predict pel values in the moving areas at both transmitter and receiver. In an actual coder the update data would be fed to a buffer, which smooths the data flow on the transmission line. In our simulation the buffer fullness is monitored by the computer and the accuracy of the coding is adjusted to improve the match between the average generated bit rate and the transmission rate. When the buffer is underfilled, portions of the background signal are transmitted to maintain the average transmission rate and to reduce the buildup of errors in the receiver's memory.

The computer keeps a record of the amount of information contained in the buffer. During periods of rapid or large area movements, the buffer occupancy will increase. As the buffer occupancy increases above preset values, the computer changes the mode of operation of the conditional replenishment system to reduce the data generation rate of the moving areas. The data generation can be altered in several ways, such as temporal filtering, change in quantization levels, subsampling in the horizontal or vertical dimensions or both, and finally, a complete cessation of updating, which causes the picture to "freeze." As the buffer occupancy increases, the coder is progressively switched to higher and higher modes of operation with additional degradation in the moving areas. The converse happens as the buffer occupancy decreases and, with little motion, the processor may even reach a state where background (nonmoving area) information is transmitted, to avoid employing the buffer.

Because the prediction errors would be transmitted via a variable length code, it is desirable to minimize them. The line difference of frame difference predictor as illustrated in Fig. 3 was found best for those situations where the previous line was available for prediction purposes; for more extensive movement, where vertical subsampling was invoked, the second previous element along the line was used for prediction. (Also see Fig. 3).

III. COMPARISON OV VS AND CP PARAMETERS

Table I lists the operating parameters and memory requirements for the "people" signals of a conventional digital VS system and the CP system simulated. The operating parameters for the digital CP system are comparable to those used in the analog mode.

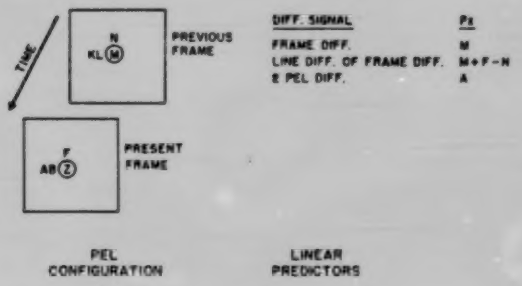

Figure 3. Configuration of pels in two successive frames which are used to obtain the linear predictors shown in the accompanying table.

TABLE I

Operating Parameters:	VS System	CP System
Field Rate	60 Hz	60 Hz
Frame Rate	30 Hz	60 Hz
Pix Update	30 Hz	20 Hz
Interlace	2:1	1:1
Pix xmitted	1	3
Lines/frame	525	263
Horizontal rate	15750 Hz	15750 Hz
Pels/line	512	340
Pels/frame	268,800	89,420
Pels/3 Pix	NA	268,260

From Table I it is seen that the operating parameters of the CP System will allow the use of standard off-the-shelf broadcast rate equipment except for the conversion to sequential scan. This requires a minor change in the camera synchronizing generator.

Since nearly the same number of pels is presented to the viewer in both cases, but they are updated only 2/3 as often in the CP System the transmission rate for the CP System should be 2/3 that of the VS System. However, the CP pictures are updated two thirds as often as the VS pictures and each CP picture has two thirds the spatial resolution of the VS picture. The resulting lower spatial and temporal correlations result in lower coding efficiency for the CP System. One major factor favoring the CP System is that it is rarely surprised by overload since no camera switching is used. This is in contrast to VS operation, where each time the cameras are switched, the completely new picture results in a transient overload condition.

This heuristic analysis of the factors affecting transmission rate indicates that the transmission rate requirements of the two approaches should be comparable; experiment showed that this was indeed the case.

IV. CODER HARDWARE

A. General

The CP System was designed to share some of the basic components of the conditional replenishment coder used earlier for VS signal processing. Changes in line and frame memory delays as well as all additional hardware changes are software controlled, allowing the simulator to easily switch from the VS System to the CP and vice versa.

B. Frame-To-Frame Interpolation At Receiver

The analog implementation of the CP System suffered from jerkiness with rapid motion due to the 3:1 field repeating in conjunction with its low temporal rate. This effect can be reduced by camera integration at the transmitter (see next Section) and frame interpolation at the receiver, as now described.

The nontransmitted frames of the digital CP System were interpolated from the transmitted frames as shown in Table II: Frames F_1 and F_4 are transmitted and nontransmitted frames F_2 and F_3 are derived as shown in Table II and Fig. 4.

TABLE II

Interpolated Display Pictures

Transmitted Picture	Composition of Displayed Picture
F_1	F_1
_*	$2/3F_1 + 1/3F_4$
_*	$1/3F_1 + 2/3F_4$
F_4	F_4

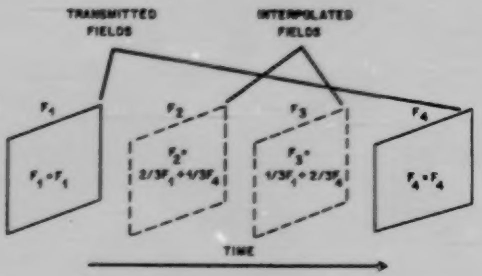

Figure 4. Composition of four successive frames from camera 1 which are displayed at the receiver, where frames F_1 and F_4 are transmitted frames and skipped frames F_2 and F_3 are formed from frames F_1 and F_4. Pictures from cameras 2 and 3 are transmitted during frame times F_2 and F_3 and are similarly treated.

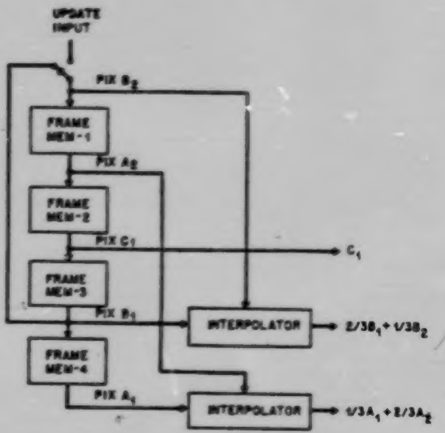

Figure 5. Block diagram of receiver frame interpolator, showing the required frame memories with appropriate taps and interpolators to form the three displayed pictures. The output of Frame Memory-3 is fed back to Frame Memory-1 through a switch to allow frame repeating when required for conditional replenishment operations.

To provide for continuous interpolation of all three pictures, the memories with appropriate interpolators are configured as shown in Fig. 5. This interpolation technique requires an additional CP frame of memory (Frame Memory #4 = 89,420 pels), because the current frame and the preceding transmitted frame must be simultaneously available for interpolation. The signals from camera source A, B, and C flow through the four memories in sequential order. The tap at the end of the third frame memory feeding to the switch at the input to the first frame memory allows for updating or repeating of old information as required in the conditional replenishment operation. Thus memories 1-3, though used in the interpolation process, would be needed anyway for conditional replenishment purposes. In Fig. 5, the camera sources are labeled A, B, and C with the subscript indicating the order of their transmission. Thus, the interpolation

---

* During these frame periods, the two pictures from the other cameras are transmitted.

C_1, $2/3B_1 + 1/3B_2$, $+ 1/3A_1 + 2/3A_2$,

is followed by

A_2, $2/3C_1 + 1/3C_2$, $1/3B_1 + 2/3B_2$,

then

B_2, $2/3A_2$, $1/3A_3$, $1/3C_1 + 2/3C_2$,

etc.

A subsequent switching operation; not shown, selects the outputs from the appropriate taps to simultaneously form the following three sequences

$$\begin{array}{ccc} \vdots & \vdots & \vdots \\ 1/3A_1+2/3A_2 & 2/3B_1+1/3B_2 & C_1 \\ A_2 & 1/3B_1+2/3B_2 & 2/3C_1+1/3C_2 \\ 2/3A_2+1/3A_3 & B_2 & 1/3C_1+2/3C_2 \\ \vdots & \vdots & \vdots \end{array}$$

which are then fed to the three separate monitors.

C. Camera Integration

One of the potential deficiencies of the continuous presence system is its lower temporal sampling rate (20 frames/sec). Flicker was avoided by displaying the received picture at 60 frames/sec; motion rendition was improved by using frame interpolation instead of frame repeating to produce the two intermediate frames needed to make a 60 frame/sec display. However, jerkiness could still be observed in large motions at high contrast boundaries. For the further reduction of this effect, we turned to temporal filtering of the input. Recursive temporal filtering left objectionable trailing smears when utilized in amounts necessary to substantially attenuate the jerkiness. However, Musmann and Klie[6] in their studies of low bit rate video telephony found that the use of nonrecursive temporal filtering was valuable in reducing the degradations resulting from low sampling rates; their configuration, shown in Figure 6, required two additional frame memories. This has an amplitude frequency response given by

$$|E_o(w)/E_i(w)| = (1 + \cos w\tau)/2$$

which, for the preferred values used by Musmann ($a_0 = a_2 = 0.25, a_1 = 0.5$) gives the dashed curve (M) of Figure 7. As a very inexpensive compromise substitute, we have used the storage effect inherent in the camera tube to provide a comparable form of nonrecursive temporal filtering. Target storage is utilized by blanking the normal camera readout scanning beam for one or both of the frames immediately preceding the desired frame readout of the signal. This has the effect of extending the camera integration time from one frame (normal) to two or three frames.

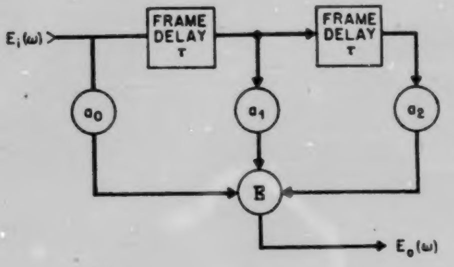

Figure 6. Equivalent circuit and responses for various temporal filters.

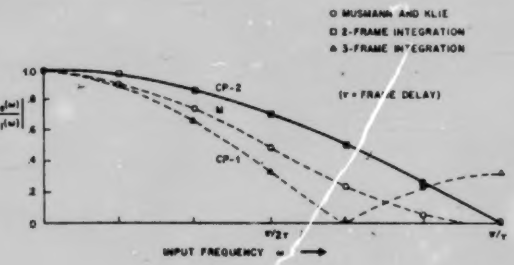

Figure 7. Relative temporal frequency responses of various filter arrangements. (Normalized at w=0).

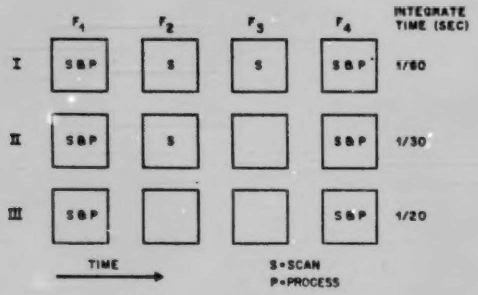

Figure 8. Diagram illustrating three sequences of camera integration available to the continuous presence system where frames F_1 and F_4 are always scanned and processed for transmission and frames F_2 and F_3 may be scanned (but not used) or not scanned, thus allowing the optical input signal to be integrated over 2 or 3 frame periods.

If the scanning beam of both preceding frames is blanked, as shown in sequence III of Figure 8; the equivalent signal processing circuit (neglecting the nonlinearity of the vidicon) can also be represented by the equivalent circuit of Figure 6, but subject to the restriction that $a_0 = a_1 = a_2 = 1/3$. That is, all three input frames are weighted equally. In this case, the theoretical relative frequency response is given by curve CP-1 of Figure 7. Note that this curve falls off more sharply than curve M, and indeed, some subjects did comment that the motion was rather smeared with this operating condition. We then tried the remaining alternative, wherein the scanning of the frame immediately after the processed one is scanned out and discarded. This is illustrated by sequence II of Fig. 8. In the equivalent circuit of Figure 6, this amounted to setting $a_2 = 0$ and $a_0 = a_1 = 1/2$, and yields the curve CP-2 of Figure 7. Operation in this condition definitely reduced the smearing while allowing some jerkiness, and appeared to be the preferred choice. This condition is now used exclusively when operating this system. Note that when external delays are used to form the temporal filter, there is a limitless choice of coefficients, but when the camera tube integration is used, the only two sets of physically realizable values result in the filter characteristics shown, which bracket the optimum characteristic used by Musmann.

V. SIMULATED GRAPHICS TRANSMISSION

A special multilevel graphics coder is being built. In the meantime, we are simulating the use of this coder using analog techniques. (See Figure 9).

The output of the graphics camera is fed to an analog disk memory. When the graphics transmission button is pushed, the current graphics image is stored on the analog disk and is displayed on the receiver graphics monitor. This monitor is in addition to the ones used for the people pictures, and would normally operate on a 525-line or better standard.

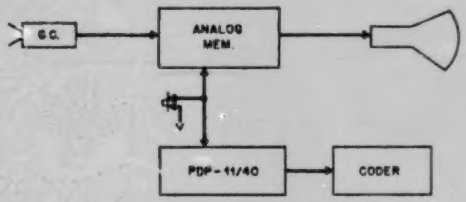

Figure 9. Block diagram of graphics transmission simulator when graphics switch is closed, one frame of graphics is stored in memory and displayed until erased or replaced. For duration of transmission of the graphics frame the computer subtracts the graphics bit rate allocation (1/3 of total bit rate) leaving the balance (2/3) for transmission of "people" signals.

When the graphics button is depressed, the computer controlling the conditional replenishment system subtracts the graphics allocation of bits (typically one-third) from the total transmission rate and uses the remainder for transmitting the "people" pictures. Knowing the total number of graphic bits to be transmitted and the graphics allocation, the computer calculates how long it will take to transmit the graphics signal. During this time it continues to process the "people" pictures at the reduced effective transmission rate until the incoming graphics would have been transmitted. At the 3Mb/sec transmission rate of which 1Mb/sec is used for graphics (when needed), only 1/2 sec would be needed for the graphics transmission, with 1 and 1/4 seconds being needed, respectively, at 1.5 and 6.0 Mb/sec transmission rates. It should be stressed that during these periods, transmission of the "people" pictures is not stopped but merely limited to a reduced bit rate, thus lowering but not eliminating the motion rendition capability.

The above graphics transmission times were calculated for a graphic system with 525-line resolution which, using the anticipated techniques, would require about 500 k bits/frame to transmit. In practice, the spatial resolution should be doubled in both dimensions to allow reasonable resolution of typewritten documents. In this case the transmission times given above would be quadrupled.

VI. SOFTWARE

The conventional strategy for controlling the rate of data generation in single channel adaptive coders is to use the buffer occupancy to determine the coder mode, with higher buffer occupancies calling for higher modes (i.e., those which code a given picture with fewer bits and correspondingly lower quality). This technique, while adequate for the control of the single channel coder, is not appropriate for a multichannel processor because it results in the bits generated by one picture affecting the coding mode of another, through the common buffer. For example, a relatively quiet picture being processed immediately after a frame of a violently active channel has nearly filled the buffer, would, under the single channel control strategy be coded in a relatively coarse mode. However, the artifacts introduced by this coarse mode would be relatively visible on the minimally changing picture of the quiet channel now being coded. These problems are mitigated by using the past history of a given picture as well as the buffer occupancy in the determination of its present coding mode.

If it should appear that buffer overflow will occur during the coding of the upcoming frame, the frame can be repeated right from the top, avoiding the very obvious and objectionable degradation of a horizontal shear at the boundary of the updated and frame repeated portions of the picture. (Studies by Rocca[7] have indicated that preventing buffer overflow by repeating a frame is preferable subjectively to invoking a freeze mode in the middle of a moving picture.) This technique has worked out very well in practice, with the resulting dynamic bit allocation among the pictures effectively providing bits where they are needed.

VII. EVALUATION

The digitized CP system with its simulated graphics adjunct has been demonstrated to a large number of people at bit rates of 1.5, 3.0, and 6.0M bits/sec. In general, the conclusions were: (1) The 1.5M bit/sec did a reasonable job with "normal" motion; was noticeably degraded with moderate motion and had considerable degradation with violent motion. (2) The 3.0M bit/sec rate was considered a good compromise between the three bit rates and exhibited probably acceptable degradation with violent motion; and (3) at 6.0M bits/sec the system was essentially transparent (within the limits of the spatial and temporal resolutions imposed by the CP scan format) but is wasteful of bit rate as it was found difficult to use all of the allowed bits even with the most violent motion.

The addition of color is expected to require allocation of about 10 to 15 percent of the bit rate to the chrominance components.

Earlier studies[3-4] have shown that analog CP is preferred to analog VS video conferencing. Informal observations indicate that this digital CP system is subjectively better than analog CP due to its improved motion rendition. Assuming that other coding impairments are about equal, we can logically assume that for equal transmission bit rates, digitized CP will be preferred to digitized VS.

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THE FASTEST FAX IN THE WEST[1]

(NASA High Speed Facsimile Via a 56 Kbps Satellite Circuit)

Samuel W. Fordyce NASA Headquarters
John W. Kiebler NASA Headquarters
Martin L. Levene RCA Camden

Late in the Apollo Program, NASA established a voice and fax teleconferencing network linking the NASA installations and major contractors involved in the lunar landing effort. Eleven Management Information Centers were interconnected on dedicated private lines switched through the Marshall Space Flight Center in Huntsville, Alabama.

This network enabled many of the management meetings and design reviews to be conducted by teleconferences.

Following the Apollo Program, the teleconference network was used for the Skylab and Shuttle Programs and expanded to include all NASA installations. A two year pilot project evaluated the usefulness of teleconferencing.[2]

The fax network established to augment the voice teleconference service has been expanded to 89 terminals. About 90,000 pages per month are sent over this network, which now carries much traffic unrelated to teleconferences. This network has been using Rapicom fax machines with a nominal speed of 40 seconds per page. Two of the busiest terminals are at the Rockwell International Plant and the Johnson Space Center.

To test the effects on NASA's internal correspondence of providing faster fax capabilities, and to pioneer development of innovative wideband communications via satellite, two NEC terminals were interconnected via a 56 Kbps circuit on an RCA satellite.

The experiment began in November 1979. RCA AMERICOM installed the 5m diameter Scientific Atlanta antenna shown in Figure 1 at the Rockwell International plant in Downey. This antenna was erected on a parking lot with the aid of a small crane. The ability to install a small satellite terminal quickly and cheaply can enable one to provide a variety of wideband communication services via satellite. The antenna is connected by a short terrestrial circuit on the premises to the NEC facsimile terminal shown in the telecommunications room, (Figure 2). Signals from the Downey antenna are relayed through the SATCOM F-2 Satellite to the dual antenna RCA Earth Station at Johnson Space Center, (Figure 3). Terrestrial circuits at Johnson Space Center provide connection to a NEC terminal in Building 1.

The special NEC Model KFS-4509 broadband digital facsimile machines were acquired for this experiment from Nippon Electric Company through NEC America. An advanced design of NEC, these machines were not previously available outside Japan and were set to operate at 56 Kbps for the first time. From the outset, the speed and quality of the experimental system has been received with enthusiasm by users at both sites. The NEC Model KFS-4509 features two scan-density options, 200 x 200 lines/inch (high resolution) and 200 x 100 lines/inch (normal resolution). Data compression is provided using a modified Huffman one dimensional coding. An error avoidance system is included which senses if a block of data contains transmitted errors and, if it does, retransmits the block of data. The transmission speed depends upon the resolution selected and upon the complexity of the message field. Typical page throughput rates experienced during this experiment are shown in Table 1. Test sheets were used to obtain the data listed for 25 and 50 lines of text. An average page throughput rate of 16-17 sec/page at high resolution was obtained from actual message traffic between the two sites during the experiment. Even with the rapid page throughput rate experienced, the quality of reproduction has been quite good. Figure 4 illustrates the level of quality experienced.

Figure 4a is a portion of an "original" message. Figure 4b is the facsimile copy of that portion at 200 x 100 lines/inch. Figure 4c is the corresponding facsimile copy at 200 x 200 lines/inch. An enlargement of a section of the received copies as compared with the original document is shown in Figure 5.

The experiment described here is part of a larger study by RCA for NASA which is defining an intra-NASA electronic message network of the future. During the first three months of the experiment, operators supplied by S. Ross and Company, an RCA subcontractor, transmitted test sheets and live message traffic to provide a part of the data base for the electronic message network study. The data collected is now being reduced and evaluated by S. Ross and Company. A future satellite communications network may evolve from the overall study which would encompass the use of not only these higher speed facsimile machines but also the use of word processor units in an integrated network designed to serve NASA's communications needs. To this end, the present experiment is providing necessary equipment performance data and system operational experience.

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1. The NEFAX-56 sends at a maximum rate of 6 sec/pg. The speed depends on the resolution selected and the amount of information on the page. Litton has a WASH FAX III unit in the White House which transmits at a 6 sec/pg rate but uses a transmission circuit data rate of 1.5 Mbps rather than 56 Kbps.

2. Samuel W. Fordyce, "NASA Teleconference Pilot Project (An Evaluation of Teleconferencing as a Substitute for Travel)," NASA HQ, Washington, DC, March 1977.

TABLE 1

Speed of Page Throughput Measured in Terms of Time to Transmit a Specific Message for Each Scan Density

Message Complexity	Time at 200x100 lpi	Time at 200x200 lpi
All white page	6 sec	11 sec
25 half lines, double spaced	10 sec	15 sec
50 half lines, single spaced	15 sec	26 sec
25 lines, double spaced	17 sec	26 sec
25 lines, single spaced	19 sec	28 sec
50 lines, single spaced	33 sec	47 sec
Typical message rate (avg. time/page)	9-10 sec	16-17 sec*

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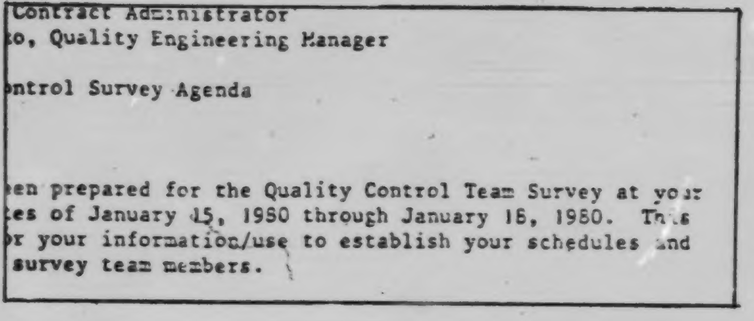
*averaged over 200 pages of messages 9 to 23 pages long

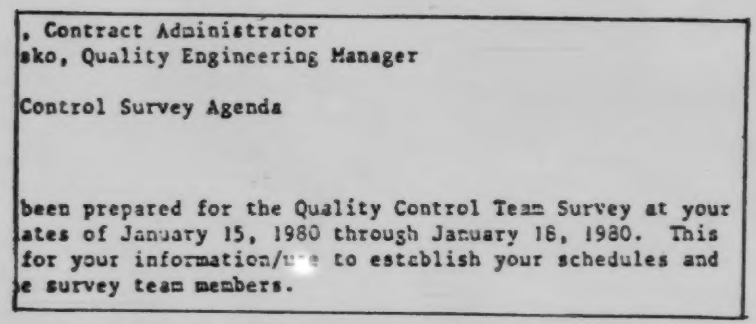


Contract Administrator
o, Quality Engineering Manager

ntrol Survey Agenda

en prepared for the Quality Control Team Survey at your
tes of January 15, 1980 through January 16, 1980. This
r your information/use to establish your schedules and
survey team members.

FIGURE 4a PORTION OF A MESSAGE "ORIGINAL"

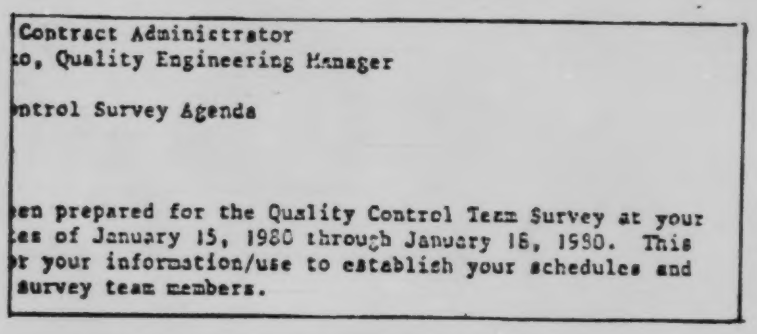


, Contract Administrator
sko, Quality Engineering Manager

Control Survey Agenda

been prepared for the Quality Control Team Survey at your
ates of January 15, 1980 through January 16, 1980. This
for your information/use to establish your schedules and
e survey team members.

FIGURE 4b FACSIMILE COPY AT 200 x 200 LINES/IN.



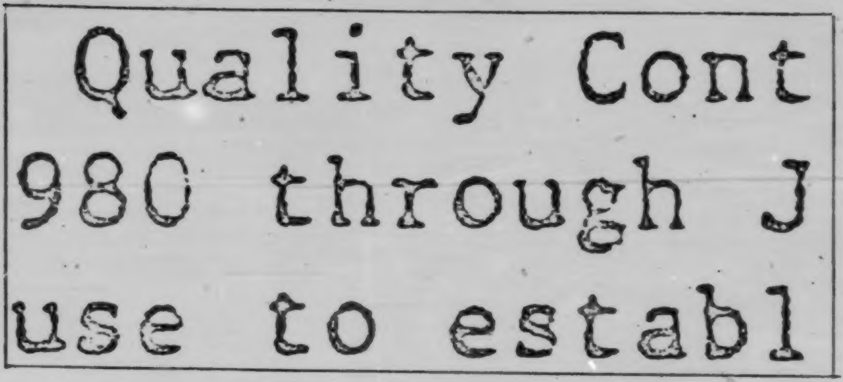
Contract Administrator
o, Quality Engineering Manager

ntrol Survey Agenda

en prepared for the Quality Control Team Survey at your
es of January 15, 1980 through January 16, 1980. This
r your information/use to establish your schedules and
survey team members.

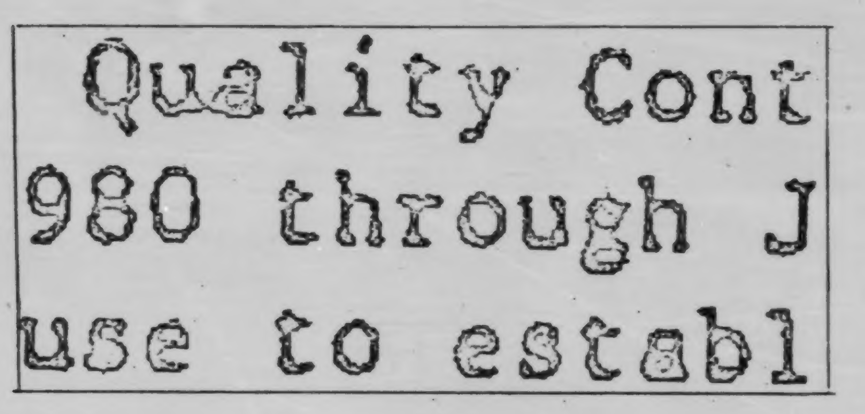
FIGURE 4c FACSIMILE COPY AT 200 x 100 LINES/IN.

FIGURE 4. QUALITY OF FACSIMILE COPY



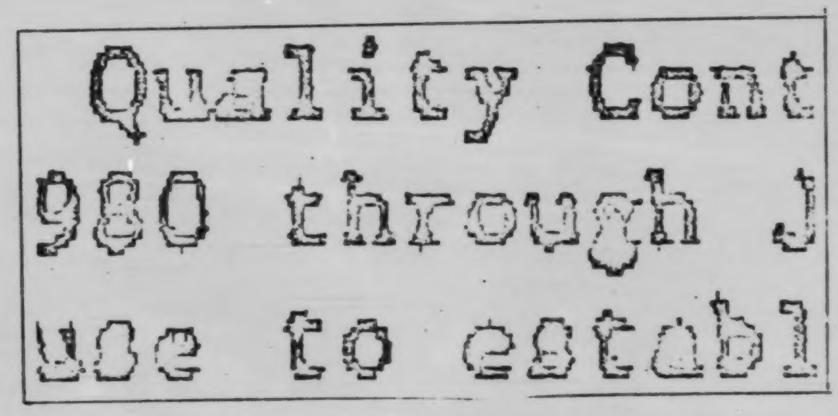
Quality Cont
980 through J
use to establ

FIGURE 5a ENLARGED PORTION OF MESSAGE "ORIGINAL"



Quality Cont
980 through J
use to establ

FIGURE 5b ENLARGED PORTION OF COPY AT 200 x 200 LINES/IN



Quality Cont
980 through J
use to establ

FIGURE 5c ENLARGED PORTION OF COPY AT 200 x 100 LINES/IN

FIGURE 5. ENLARGEMENT (5X) OF PORTION OF FACSIMILE SAMPLES

PRESTEL: THE BRITISH EXPERIENCE AND BEYOND

Hilary B. Thomas
Communications Studies & Planning Ltd.
London, England

Prestel is the only non-experimental videotex system operating in the world. Its pre-eminance is due not to the identification of a demand for the service in the United Kingdom, but to the political and marketing strategy adopted by the British Post Office (BPO), who 'invented' videotex.

The emergence of viewdata (as videotex was then called) in the early 1970's coincided with the search by the BPO management for new services which might increase revenue from the under-utilised telephone network in off-peak hours. Hence, the adoption of Prestel as a residential service, and the rapid development towards a nationwide videotex network.

The Prestel Network

The Prestel network consists of a series of replicated databases linked to update centres throughout the country by X25 links. Frames are created in the update computer and then transmitted to the retrieval centres at 2400 bps. Users access the retrieval centres via the public switched telephone network.

At the time of writing a single update centre in London supports retrieval computers in London (4), Birmingham (2), Edinburgh (2) and Manchester (2). Multiplex links allow local call access to users in Nottingham, Glasgow and Liverpool as well. By March 1981, 60% of UK telephone subscribers will be able to access Prestel locally. By 1986 the network will link over 100 computers replicating a 500,000 frame database, and will be available to 95% of subscribers. The computers are GEC 4082's, chosen for their reliability, fast interrupt handling and disc access and low cost per port. They were also chosen because they are British. Each computer has a maximum of 200 ports (to be raised to 300 in future).

The present configuration of Prestel offers primarily an information retrieval service. Response frames allow limited transactional and messaging facilities between users and Information Providers (IPs). Higher priority is placed on the extension of the information retrieval network than on interactive facilities at the present time, although a dedicated user to user message handling computer is not ruled out for the future. Direct terminal to terminal messaging is prevented by the asynchronous (1200/75) transmission speeds employed on the PSTN.

The Information Providers

The number of frames available has now increased to 250,000 and 156,000 of these frames contain information. The total number of information providers is 254, but 116 of these input information through 'Umbrella' Information Providers - large IPs who provide a 'bureau' service to those wishing to rent Prestel frames.

The information available on Prestel is as varied as the interests of the information providers themselves. News, weather and sport, consumer information, classified advertisements, travel information and financial information, education and games; these feature prominently while books, subscriptions, wine and 'everything from calculators to squash rackets' can be ordered by entering a credit-card number onto a Prestel response frame.

The Users

At the start of the Prestel Public Service (September 11th, 1979) there were approximately 1400 subscribers, almost 1000 of whom had been recruited by the BPO for their test service sample. In March 1980 a total of 2500 users are connected to the system.

Business or Residential

The early experience of Prestel indicates that, despite the original residential market strategy of the BPO, the business sector is likely to lead the uptake of videotex for the first few years at least. Business users can not only afford the (as yet too expensive) terminals, but are aware of the value of information and the cost of acquiring it.

In addition to 'general' business information such as share prices, currency rates and company information, certain specialised sectors have reacted strongly to Prestel. The travel

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industry has taken the challenge of the new technology very seriously and are studying the contribution that both public and Closed User Group (CUG) services can make to the current automisation trend within the industry.

Closed User Groups are of interest for specialist applications and where security is important. Real estate agents, lawyers and wholesale food manufacturers and distributors are experimenting with Prestel. Sales listings, stock control and stock ordering systems are already operating successfully.

As a result of the response from the business sector, the BPO have announced that from September 1980 they will offer a Closed User Group (CUG) Business Service from a dedicated computer in London. This will operate separately from the Public Service and will not use the name Prestel. The Dutch PTT have operated a CUG service commercially since July 1979; the residential market trial of their Viditel service will not start until August of this year.

In the United States, GTE's approach to videotex also supports the view that businesses will be the primary users of videotex. Although a derivative of Prestel (GTE bought the sole rights to develop Prestel in the USA), the Service they are offering is quite different. Telenet, the packet switching network connects intelligent terminals with full keyboards which provide sophisticated user to user interaction (transactions and messages) as well as information retrieval using keyword search. 20-30 major US corporations are testing the service for provision of in-house Closed User Groups.

Does the emphasis on more intelligent terminals indicate that the 'cheap' and 'easy-to-use' attributes of the Prestel model may not continue to attract the business user? As he becomes more sophisticated in his usage will he not find the tree search procedure tedious and limiting?

What will videotex look like in 1990 and beyond?

In the rapidly changing communications environment predictions are difficult. The results of current trials of videotex will indicate where and how the market may develop. Despite the early stage of development of these services, certain trends can be identified. Already Telidon offers more sophisticated graphics and 'photographics'. Prestel will incorporate alpha-photographic display by the end of the 80's - although this recently announced 'Picture Prestel' will involve a new generation of terminals.

Increasing use of intelligent terminals means that videotex may resemble more and more the existing time-sharing systems. The Source and MicroNET do not use television sets as the display medium but they are essentially videotex, providing an information retrieval, data processing and messaging service quite inexpensively at off-peak rates on TeleNET and the local PSTN. Many of the current users of these two services are hobby computerists, but the decreasing cost of terminals and the increased interest in home information and communications systems may lead to the demand for a wider range of residential services, including videotex.

Once the television in the corner of the living room is accepted as an active medium as well as one for 'passive entertainment' users will demand more and more interactive processing and communications facilities from the information source. I do not suggest that videotex will be ousted by the home computer and the on-line business information service, but rather I believe that videotex itself will evolve in order to take its place as one of the tools of the Information Society.

CEEFAX COMES CHEAP AND CHEERFUL

Colin McIntyre

Editor, CEEFAX
British Broadcasting Corporation
London, England

Representatives from some 108 countries have now trekked through the CEEFAX Newsroom at the British Broadcasting Corporation's television centre at the White City, London.

One of the journalists has even stuck up a notice on the newsroom door declaring that it is Registered with the English Tourist Board.

Reactions by visitors range from: " If it's so good, how come we didn't invent it " to " For goodness sake don't tell the Arabs that it is cheap, or they'll never want it. "

In between, and particularly among the professional broadcasters, is admiration and relief at the simplicity of the project and its almost incredible cheapness from a transmission point of view.

THE CEEFAX STORY

The BBC established CEEFAX - a nationwide, two-network service of News and Information - for a capital investment of about £200,000 (or well under $500,000 US).

For British teletext - to give the system its generic name, and thus embrace the parallel ORACLE service broadcast by the commercial television networks - is simply a matter of "good housekeeping".

Teletext needs no extra bandwidths, no extra transmitters, no extra power.

It uses some spare capacity within the existing television signal to send controlled data information into the ordinary domestic television set already in the home.

In layman's terms, it uses two spare lines in the British 625-line television format to transmit digital pulses.

These signals represent letters and graphics which a decoder can then reconstitute and display as words and diagrams on the home television screen.

CEEFAX was developed by BBC research engineers who were looking for new ways of subtitling programmes for the deaf and hard-of-hearing. (1)

They were working on the so-called closed captions that can be broadcast with a programme but can only be read by deaf viewers with an extra bit of apparatus - a decoder.

The subtitles are thus only seen by those who want to see them, and do not intrude on the picture of those able to hear television as well as see it.

In passing, one should note that this hidden subtitling will be equally important to countries which have two or more languages.

In South Africa, for instance, programmes made in English could carry hidden subtitles in Afrikaans (or Zulu) and vice-versa. These subtitles would only be seen by the viewer who had taken the positive act of setting his decoder to display the appropriate subtitling page.

No viewer need be affronted by a constant reminder that some of his countrymen spoke a different language to his own.

The same would obviously apply in Canada and Belgium and Puerto Rico, and numerous other countries; as well as those near multi-language borders who can get several different national TV services.

In Britain it is hoped eventually to offer this kind of language subtitling to our Welsh and Gaelic-speaking peoples, even perhaps to Asian immigrant minorities.

However, no sooner had the BBC research engineers come up with their suggested solution on subtitling, than it was realised that the BBC had something more than a better way of subtitling. It was, indeed, a whole new medium of broadcasting.

MORE THAN JUST SUBTITLING

The BBC Director of Engineering at the time, now Sir James Redmond and retired, told his colleagues on the BBC's Board of Management that they should now plan on the fact that CEEFAX could provide not only subtitling but a full service of news and information.

There could be 'pages' of news, of sports results and business information.

There could be weather maps and travel details, such as airport arrivals and departures.

There could be features material - on gardening, Do-it-Yourself activities, and every sort of hobby and private interest.

There was room for theatre reviews, book reviews, and up-to-date listings of the Top Thirty pop tunes.

There could be games and quizzes, puzzles and competitions, chess problems and CEEFAX bingo.

It is perhaps a sad commentary on our times and on our community priorities that since then the subtitling side of teletext has been somewhat neglected and slow to develop.

It is only in 1980 that some definite progress has been made towards providing anything more than token experiments.

In March, the BBC rescreened the David Attenborough series, "Life On Earth", with full CEEFAX subtitles on all 13 episodes.

Admittedly, subtitling is an expensive operation - expensive in terms of staff-time and effort and the use of equipment.

It still takes some 30 hours of work to fully subtitle a one-hour documentary. It ties up a good deal of equipment in the process: video playback machines, a small computer, and a VDU (Visual Display Unit).

New ways of speeding-up the process are being tried, involving more computerisation.

These may involve a lowering of standards as regards the quality of the subtitling.

However, the deaf have made it only too clear that their priority is quantity. They want anything that will give them extra clues, on as many programmes as possible.

Spokesmen at deaf conferences have made the point that they do not demand full perfect grammatical English in every case.

This is why CEEFAX is experimenting with several approaches, including what we call captioned clues, which are little more than the key words of a panel game or light entertainment show, and precis subtitling, which is a running commentary on the action, not necessarily in step with the actual spoken dialogue.

It has been argued too that the deaf will even willingly learn to read a special abbreviated language of their own, if this would mean more programmes could be covered in this way.

Some of this may be met by another of the BBC approaches - the use of the Palantype-shorthand machine in conjunction with a computer trained to turn the Palantype symbols back into roughly grammatical verbatim phrases.

Whatever emerges from these trials, subtitling remains an integral part of CEEFAX and could eventually represent one of the biggest breakthroughs for the deaf of our time.

Meanwhile, it should be stressed that all teletext is a boon for the deaf and hard-of-hearing.

Because teletext is written out in words and pictures they are not at any disadvantage. Teletext indeed is a form of printed radio.

Therefore, although subtitling is developing slowly, there is a lot in it for the deaf from the very start.

And, meanwhile, the system is being paid for by the news conscious viewers, the businessmen who want their share prices and exchange rates, the gamblers who want their race results.

HISTORY

Teletext is a product of the 1970's, even if it is only coming to full fruition in the 1980's. (3)

The first BBC research papers envisaging the system do not go back beyond 1970, when the then head of BBC Research Department at Kingswood Warren in Surrey, Peter Rainger, put forward some 'Notes on Electronic Methods of Domestic Data Displays'

By 1971, work was under weigh. It took advantage of new knowledge in the field of data transmission, the development of Read Only Memory chips, and the rapidly descending cost of computers.

By early 1972, the BBC was confident enough to demonstrate its experiments to the Press, and to file the necessary covering patent applications.

On-air test transmissions followed, while talks began between the BBC research people and their equivalents at the IBA - the Independent Broadcasting Authority, commercial television's supervisory body.

At this stage the imaginative step was taken of involving British industry - both the set manufacturers and those who would supply the essential decoder components.

It is perhaps a significant factor that the first three makers of Large-Scale Integrated circuits for teletext should be the British branches of major multinationals.

First into the field was Texas Instruments - of Bedford, England; but not unconnected with a Bigger Brother in Dallas, USA. (4)

T.I. were followed by Mullard (5), a British subsidiary of the giant Dutch complex Philips of Eindhoven; and subsequently by General Instrument Microelectronics (6) of Glenrothes, Scotland, and points west.

By 1974, the BBC had decided to go ahead and develop the editorial side.

As a lifelong BBC journalist I was invited to recruit a small team of four sub-editors and four research assistants (junior journalists) and to start sending out live news and information.

Live transmissions began at the end of 1974, timed to coincide with the opening by the Duke of Kent of a biannual meeting in London of the International Broadcasting Convention.

CEEFAX has continued ever since.

POLITICS

CEEFAX is a good example of the pragmatic approach of the British to new technologies and ideas.

Despite our tendency to over-publicise union demarcation disputes, and alleged conservative industrial practices, the British in practice have a quiet way of getting on with things. They are much less concerned than many other countries with holding commissions of enquiry, seeking rule-making legislation, or enjoying the panaceas of market research.

It should not be forgotten that high-definition television itself was on the air first in London in 1936 - the first such service anywhere in the world.

Rutherford, in the string-and-sealing wax conditions of the Cavendish Laboratory at Cambridge, was instrumental in the later development of the atomic bomb. And radar and jet engines perhaps also help provide an answer to that question asked by the CEEFAX visitor: "How come we didn't invent it first ? "

As far as official permission went, the BBC's Director of Engineering approached the Minister responsible for broadcasting, Lord Harris, himself a journalist, and told him about teletext.

The BBC engineer explained that it was the BBC view that as teletext was part of the ordinary transmission of the television picture - and needed no extra bandwidths or transmitters - it fell logically into the realm of broadcasting.

The Minister agreed, and at once authorised a two-year pilot trial. (7)

MARKETING THE IDEA

During this probationary period, the technical experts had worked out an agreed final Specification, which was published jointly by the BBC, the IBA, and BREMA - the British Radio Equipment Manufacturers' Association, in September 1976. (8)

This specification still stands, though work is just beginning on a second Technical Specification, which, while remaining completely compatible with the first, will incorporate a host of new features.

These range from an extended polyglot alphabet which covers all the accented characters used in any Latin-based language, to vector graphics and new design facilities which will match those of any teletext system yet devised.

All these new extras, let it be emphasised once again, will be completely compatible with the existing public service of teletext in use in Britain today.

Teletext was also being looked at by the British parliamentary committee set up to examine the Future of Broadcasting in the United Kingdom.

The report of this committee, which was chaired by Lord Annan and is generally known as the Annan Committee, endorsed the view that teletext was a part of general broadcasting.

It recommended, without qualifications, that the BBC and the IBA should be authorised to provide teletext information services as an extension of their existing services.(9)

The British Government, which had kept an eye on the pilot trial, then gave a go-ahead for a full public teletext service in November 1976 - and incorporated Lord Annan's recommendations in a subsequent White Paper on Broadcasting.

CEEFAX was legitimate, and it was now a question of the manufacturers making sets and the public buying them.

Inevitably it was a chicken-and-egg situation. The manufacturers were loathe to set up production lines with teletext an unknown quantity, and there was no way of getting teletext known if there was only a handful of sets in the whole country.

Trying to describe teletext to the man in the street is like trying to describe an elephant to someone who has not even seen a picture of one. The explainers end up with an exasperated cry:- "Well, you'll know what an elephant is when it steps on you."

CEEFAX began appearing at exhibitions and trade fairs, a few sets were scattered around in the homes of Very Important People, and electronic enthusiasts began assembling their own versions. (10)

Two magazines published supplements on how to build teletext receivers, and it is estimated that some 2,000 sets appeared in this way. (11)

But at first there were only a few hundred, then a few thousand.

A good proportion of these were owned by the broadcasters themselves, by those involved in set manufacture and in the media, and by the trendy rich who would buy almost anything that was new and expensive.

We dubbed these viewers the Super-Joneses or the people the ordinary Jones's were trying to keep up with.

The new service was given very little publicity and promotion, after all there were hardly any sets on the open market - that chicken-and-egg situation again.

The BBC had made a mistake once before when it extensively promoted the introduction of colour (a British first in Europe) only to see all the colour sets bought up in the first few weeks. And it was the BBC, not the manufacturers, whom the public blamed for underestimating the demand.

By 1978, it was clear that teletext was here to stay. It was part of the production and marketing plans of almost all the major set-makers in Britain. Those who had not been involved in the early stages found themselves having to produce expensive hand-tooled versions in their laboratories.

Prices for these early sets were high, though it was clear that the components involved would rapidly fall in price once they were produced in quantity.

By the end of 1978, the manufacturers announced plans for down-market 22" sets, instead of the luxury 26" models, and real production began at last.

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INTERNATIONAL TELETEXT

As teletext made slow but steady progress in Britain, interest abroad heightened.

Sweden was first in the field, using some of the BBC's original test equipment, but later following this up by buying a complete new CEEFAX-style transmission system. (12)

Australia was also fairly quick off the mark, but then encountered a longish period of delay, while standards were discussed. Then in February 1980, the Minister of Posts and Telecommunications gave a final go-ahead, and several Australian television stations began broadcasting CEEFAX-style pages.

By this time, trials and pilot schemes were also going on in Denmark, Holland, Austria and Germany.

France had been sufficiently impressed with the British progress to decide to re-invent teletext and produce its own version, christened ANTIOPE. Unkind critics suggest it was deliberately designed to be just incompatible with U.K. teletext.

However, despite massive government support and a concentration on promotion and demonstration over broadcasting, the French system has still to be fully proved by on-air transmission over any length of time.

ANTIOPE certainly has a number of improved features on the graphics side, even if these themselves show signs of being overtaken by TELIDON from Canada, and our own compatible CEEFAX Mark II system.

Germany, perhaps the key to a European solution, now seems likely to accept the British standard, and has embarked on a large-scale 1980 trial.

German progress had been delayed by a healthy battle as to who should run this teletext service. Was it a case of a "screen newspaper" (Bildschirmzeitung) which belonged properly to the newspapers or "videotext" and thus in the province of the broadcasters ? (13)

Certainly teletext as we know it was a central feature at the Berlin Funkausstellung in 1979, when serried ranks of television sets displaying text filled the exhibition halls. The Germans hope to start their pilot trial with 10,000 sets - a wry comparison with the CEEFAX start with only half-a-dozen.

With Austria, Germany, Holland, and later this year, Belgium, all involved, the possibility of EUROFAX exchanges looms; and the BBC has also begun discussions with an Australian television station about the possibility of intercontinental teletext exchanges - swapping pages either via the telephone or directly by satellite.

All this is a very far cry from those early days in the mid-1970's, when just four sub-editors started up regular CEEFAX broadcasts from a small back room in an engineering area of the television centre.

If Germany is the key to Europe, the United States is, of course, the key to teletext in the Americas - where the 525-line NTSC standard prevails.

The smaller number of lines in the American television picture complicates matters slightly. It could be that the USA will have to use a different bit-rate for transmission, or alternatively accept a slightly smaller 'page' for teletext.

This could be, say, 20 rows deep instead of the 24 of CEEFAX; and only 32 characters across instead of the 40 of CEEFAX. (14)

With the blessing of the FCC a full CEEFAX-style experiment was carried out in 1979 by television station KSL-TV in Salt Lake City, and it worked extremely well.

Other trials were undertaken by CBS in St.Louis, and a small MDS station in Philadelphia (Micro-TV Incorporated) initiated a full on-air service using a modified teletext version of its own.

One particularly interesting feature of the Philadelphia system was the ability to transmit the news-pages provided for cable by the main wire-services.

Even if there are conflicting systems at the moment, microprocessors will probably be able to make them compatible in the end.

Certainly there is a good chance that the BBC's motto " Nation Shall Speak Peace Unto Nation " might need amending to read - By Means of Teletext.

THE EDITORIAL PATTERN

With almost all the technical problems solved, and the main constraint now a question of production and marketing, the burden of proof shifted back to the providers of teletext software - the editorial side.

Would the public pay, at least to start with, something like 50% more for a television set in order to acquire information that was to a great extent already available elsewhere?

What particular virtues had broadcast teletext over existing media, and then again would not today's broadcast teletext be overtaken by more sophisticated versions in just a few years time ?

Would videotext or viewdata (and it should be remembered that nomenclature is still a problem in this field) swamp the infant teletext ? (15)

The British Post Office had embarked on a huge scheme involving viewdata information by telephone. Although this system Prestel suffered delays and rather crept on the air in 1979, it is due to go fully public on a large scale in 1980.

Would not Prestel - with its 150 separate Information Providers (IP's in the current jargon) and its theoretically infinite number of pages render broadcast teletext obsolete before it was established ?

What, if any, was the real relationship between the two forms of supplying data information ? Were both parties correct in seeing their services as complementary, rather than competitive ?

All these questions needed to be asked, and were asked.

In simple terms, the Post Office system will be available to every business-house in Britain and the 50% of households with a private telephone. Teletext, of course, already reaches some 97% of the population who own television sets - even if so far only a few of these have teletext decoders.

The first viewdata sets were also much more expensive than teletext-only ones, though mass production would probably bring down the prices in both cases.

A major question still remained. Would the public be prepared to pay specific sums and face much larger telephone bills to acquire information via Prestel ?

It could be argued that there was already a cultural shift involved in getting people to read news and information from their television screens when it was there for free as part of the television broadcast. Would it not be a much larger change to expect them to pay for it ?

Each viewdata page summoned-up on the Prestel service will cost a viewer not only the price of a telephone call and a charge for talking to the computer, but a fixed fee for each page accessed.

Broadcast teletext also has the advantage that it can be left on in home or office for as long as one wants. A viewer can leave his set tuned to a chosen page or sequence of pages - be it news headlines, commodity prices, share movements, or even cricket scores - and this information will be updated every time new details are inserted by the editorial team.

And every teletext page, incidentally, carries a constantly-changing digital clock, tuned to an atomic clock at the National Physical Laboratory in Teddington.

In the case of Prestel, however, the viewer would presumably find it wasteful to keep a telephone line open for long, and would still have to re-dial from time to time to see his information updated.

The great promotional advantage of an offering of 200,000 pages on Prestel is offset by a somewhat complicated system of indexing. Until page-numbers are learned by heart in the way that one recalls a few favourite telephone-numbers, the Prestel tree-system of indexing can be laborious.

It also should be noted that even with teletext, on its present two-line pattern, and the system does allow for eight lines eventually, it takes two-and-a-half hours to read the combined output of three teletext networks.

Not that teletext is designed for reading from cover to cover, but isn't 2½ hours a goodly limit, even in an Age of Leisure ?

THE EDITORIAL TASK

The Editor's job in CEEFAX thus became one of identifying what teletext could do that other media could not, or what teletext could do better than existing forms of communication today.

Anything involving speed was an obvious must. Newsflashes and quick summaries could be broadcast and in every viewer's home as quick as an editor could type.

There is no question of waiting for deadlines or appropriate programme breaks, it is a question of immediate split-second editorial decisions and action.

Horse-racing results are on the screen within minutes of the end of the race, together with the official betting odds.

A viewer can watch one football game or race-meeting on his television set, while superimposing on his picture the written results from other football games and horseracing taking place anywhere across the country.

On one memorable holiday Monday, CEEFAX covered eighteen separate race meetings. It provided instantaneous information of the kind that was unobtainable elsewhere - at least until the next day's sporting journals were on sale.

The second great factor is convenience.

Teletext information is available to suit the viewer's convenience. It is he or she who decides when to read the chosen pages of news, weather and consumer facts.

It is no longer the broadcasters in their wisdom who decide that at such-and-such a time of day the viewer will have a certain choice of programmes (or almost no choice, as the case may be).

Power has been returned to the viewer to chose when he wants his teletext data.

In Britain today, that information is available during all the hours that TV is broadcast, even if it is only a Test Card.

CEEFAX journalists are continually updating the information from 0600 in the morning until 2400 hours that night.

On special occasions - such as the night of a big boxing match or when elections results are due - CEEFAX stays on the air until the end of the event.

CEEFAX STRENGTHS

Apart from the endemic strengths of speed, convenience and choice built into the system, CEEFAX as an arm of the main BBC benefits from its integration within a large public corporation.

With a constitution which enjoins the BBC to inform, educate and entertain, with teletext seen as an integral arm of BBC broadcasting, we in CEEFAX feel that there is no subject or topic that is not relevant to our output.

If our bread-and-butter activity is news, it is news about everything: international and domestic affairs, sport and business, weather and travel, consumer matters and leisure-time activities.

It can be fairly specialist news: about education and art exhibitions, about farm prices and plant diseases, about rock music and concert tours, about traffic planning and the brewing of real ale in country pubs.

As teletext developed, it was clear that one great strength was this integration with the BBC as a whole.

CEEFAX could draw on the combined efforts of all the BBC's main radio and television newsrooms throughout the country - from Plymouth to Aberdeen, from Bangor to Belfast.

CEEFAX could also draw on the two dozen BBC local radio stations sited in most of the main towns and cities of Britain.

CEEFAX could call on the services of the BBC's Consumer Unit, and its Travel and Motoring Unit; on the BBC's Economics Correspondent and its Community Relations reporter; and on all the BBC's offices and correspondents in the world's capitals.

In the CEEFAX newsroom, the Chief sub-editor or a designated writer, listens in as the overseas correspondent or reporter reads his despatch over the telehone.

He can have a newsflash on the air before that reporter has finished reading his piece to a recording machine. And in cases of doubt he can put questions to our man in Peking or Washington with fingers poised over the keyboard to transmit his answer direct to the teletext-owner's set.

It must be the quickest and most direct form of journalism ever invented.

Another major strength resulting from CEEFAX's role within the BBC is that it can keep viewers informed of developments affecting that viewer's own television or radio enjoyment.

Thus, CEEFAX gives last-minute news about changes in programmes, or can bill guests who have agreed to appear long after the details have been printed in the TV programme guide or the daily newspaper.

Teletext can be used to explain why a programme is running late, or it can be consulted at any moment as to the alternatives on offer on other channels - even, dare one say it, on the rival network !

Indeed, the more broadcast teletext is integrated with the mainstream television output, the greater its usefulness, and the more justified its claim to be part of broadcasting.

Teletext can supply back-up information, particularly where this involves long and detailed lists, charts or graphs.

It can suggest related programmes that are worth watching if one is impressed by the one being viewed.

It can tie in closely with educational and instructional programmes - in the case of the BBC with such programmes as the Adult Literacy Campaign and a series on How to Write a Letter. (16)

A teletext facility which is important to education is the REVEAL button, which is part of the hand-control system.

This allows part of the teletext page to remain hidden until the viewer himself gives that extra command of REVEAL by pushing the appropriate button.

Programmed learning, and an almost two-way interactivity, can be achieved with this facility on schools programmes.

The Question is put, with the answer hidden. Once the viewer has made up his mind on his own answer, he can press REVEAL and see if the computer agrees with him.

Teletext is also an excellent way of updating or correcting written educational material already posted to schools.

TELETEXT SHOULD BE FUN ....

Although one is inclined to stress the more serious-minded uses of broadcast teletext when addressing an academic audience, it should not be forgotten that television is an entertainment.

For every viewer who turns to his or her television set for hard news and education and worthy information, another nine probably regard it only as a small-screen cinema theatre in the home.

CEEFAX, from the start, has carried several lighthearted pages, including its now well-established 'Charivari' page which covers all those downpage items with which a newspaper editor fills a blank spot.

However, one thing we learnt from our special Christmas and Holiday editions was that there was a real market for fun items.

In consequence we have deliberately begun to increase the entertainment content.

Much of the teletext magazine on the BBC's second network, BBC 2, is now devoted to straightforwardly entertaining our audience - with jokes, puzzles, quizzes, even a Grafitti Wall of witty prescriptions for coping with life.

It is very clear from our feedback - and CEEFAX feedback is as strong and individual as anything I have ever met in a quarter-century of broadcasting - that the public are now looking to teletext for relief from the weightier problems of the day.

On Valentine's Day we accepted postcard greetings for broadcast on a whole special section of CEEFAX.

We did the same at Christmas, where several hundred requests came in, and all but the few utterly illegible were met.

We also ran Christmas bingo. In this case the public were invited to send a stamped-and-addressed envelope for a set of bingo cards. The numbers were then hidden throughout the BBC 2 magazine. Viewers had to track the winning combination down, and if lucky forward the card to us for a small reward of BBC records or books.

A very simple, and very rewarding game - and only incidentally providing us with valuable market research information.

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This feeling of participation, of involvement with what your television set can say to you, introduces a new element in broadcasting. It has something of the 'phone-in programme, but with a guaranteed response.

The viewer is asking his friendly home television set a question, and he is getting an answer - even if that answer is only a time-check from the atomic clock.

There is a sense that one might be the only person in the country that has chosen that page, at that particular moment.

There is a sense that the CEEFAX journalist who has just written it is talking to you direct, and to you alone.

If there is an error there, or a spelling mistake, the viewer feels entitled to ring up the BBC and say so.

If he does so - and many do - we can correct the error in front of his very eyes, while his admiring family looks on.

The public are our proof-readers.

Partly for reasons of economy, partly to emphasise this very personal involvement, CEEFAX relies heavily for contributions on its audience. They send us jokes, and problems, and suggested grafitti. We run a Points of View page with comments on our programmes, and it can only be a matter of time before there are Letters to the Editor, and an Agony Column answering problems.

As our Valentine and Christmas pages showed, the public delight in seeing their names in lights on the television screen.

No problem, perhaps, with some 100,000 viewers, but what will it be like when we have passed the first million ?

Perhaps that will be the inevitable moment when CEEFAX goes regional, inserting truly local pages at state or even town level. For that is an obvious corollary to the personal involvement of teletext - much more local news and information.

The more local the news and the road news, the cinema information and the greetings cards, the more significant.

There is no reason in the longterm why teletext should not be inserted at almost village transmitter level.

WHAT NEXT ?

Teletext is in its infancy, and it would be a brave man who forecast where it will be in five or ten years time.

But it is a strong, robust baby, and has already shown signs of maturity beyond its years.

It cannot be stressed often enough that CEEFAX is alive and well in Britain today.

It is no dream of the future, but a full public service, seven days a week, 365 days a year.

There are some 50,000 sets in the country today, the forecast is for well into six figures by the end of this year.

By the end of 1981, this total could be a quarter-of-a-million; with a million or so forecast by the end of 1984. (17)

Asked to look into the future, and I am talking of little beyond the mid-1980's, I see greatly enhanced graphic capability, and, above all, telesoftware.

Telesoftware is a way of broadcasting software computer programmes by means of teletext. These programmes will then activate home computers or intelligent microprocessors.

The programmes might range from such mundane applications as help with calculating one's Income Tax to suggesting a Best Buy in the car-insurance field.

They could provide all sorts of programmed learning of an educational kind.

And, remembering that our purpose is also to entertain, they could supply home computers with a football Game of the Week, a chess problem or bridge problem, or even ways of calculating one's biorhythms and casting a horsoscope.

Most of the social applications of teletext have still to be identified and defined.

Others have already emerged as we seek to fulfill our brief to inform, educate and entertain.

We think we have the medium, let us now join together to decide on the message.

(May 1980)

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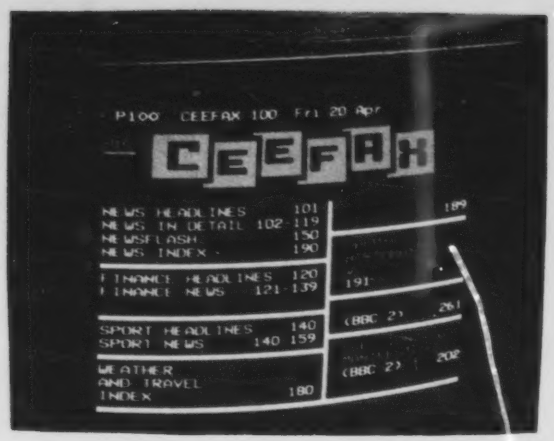

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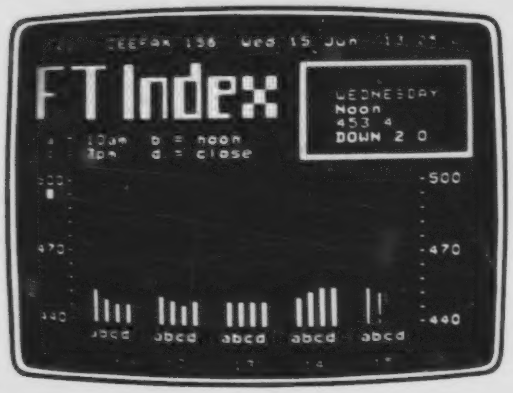
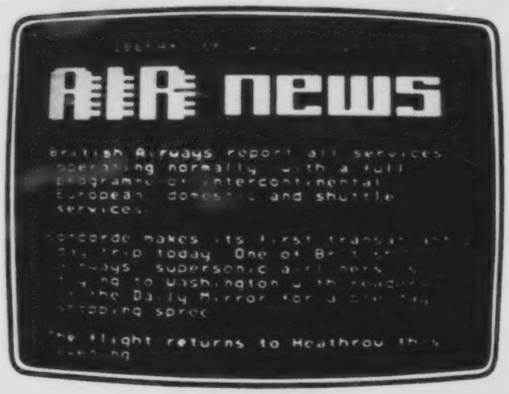
The CEEFAX Index Page as it appeared last year on Friday, 20th April.

A view of the CEEFAX newsroom - with Sub-editor Audrey Adams at work entering material onto the computer.



CEEFAX is particularly useful for graphs and charts - in this case the Financial Times Index (the equivalent of the Dow-Jones Index) which is entered hourly.



AIR news

British Airways report all services operating normally, with a full programme of intercontinental, European, domestic and shuttle services.

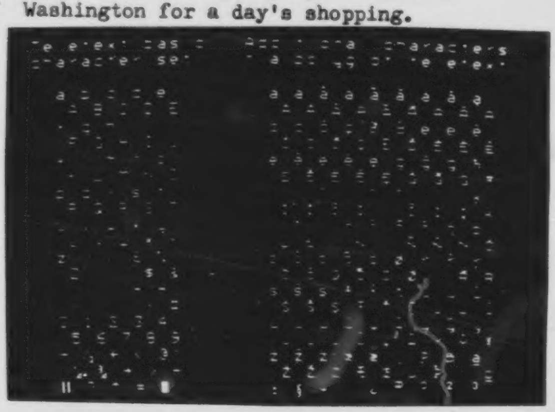
Concorde makes its first [illegible] trip today. One of British Airways supersonic airliners is [illegible] to Washington with readers of the Daily Mirror for a [illegible] shopping spree.

The flight returns to Heathrow this evening.

A typical CEEFAX travel page - in this case taking note of a newspaper promotion trip by Concorde, flying readers to Washington for a day's shopping.

CEEFAX 167 Wed 23 Aug

A more domestic note - a recipe for Boston Cream Pie.



A future capability - an extended alphabet to include all the accents used in any Latin-based language.

THE POTENTIAL OF TELIDON AS AN INTERACTIVE MEDIUM

Dorothy Phillips
Department of Communications
Ottawa, Canada

Abstract

Telidon is a videotex technology developed in Canada which promises the flexibility to incorporate many types of interactive communications into the videotex systems of the future. Many potential future services and modes of interactive communication have already been envisaged for home, education, business and medical environments. Many other uses of new technology may emerge as people with a variety of skills gain access to it.

Present reality however is still quite a long way from this envisaged world of fully available, interactive, computer supported communications. Technical developments are in progress and field trials of Telidon in Canada are now being put in place. There are forces of both impetus and restraint which may determine the course of development of videotex systems from the present reality to the envisaged future.

Introduction

Videotex developments promise new means of interactive communication between and among people. All of the combinations of human communicators, one to one, one to many, many to one, group to group and networks are possible with these new data systems.

This is the story of Telidon development now taking place in Canada with some view of the possible future, of where we are now, and of some of the pressures and restraints along the road to development.

Telidon was born in Canada in August 1978 at the Canadian government research laboratories in Ottawa. It was several years in gestation beginning in 1973 with the study of ways to transmit graphical images over transmission lines. The goal was to make efficient use of the ubiquitous telephone lines and to avoid creating delays by sending too many signals over the narrow band lines. This software development was transferred to Norpak Limited in 1976 where hardware was designed to house the software and several special applications were produced and marketed. In the face of growing world wide interest in Videotex systems, the Canadian government decided to demonstrate an information retrieval application of the software in 1978 (Madden, 1979a)[2] . Since that time many companies have become involved in the development. Before describing the possibilities for interactive communication, it is important to look at some aspects of the Telidon technology which give it the flexibility to allow for many future developments.

Telidon Technology

Telidon is a second generation videotex system. Telidon technology is basically a graphics transmission protocol which can also transmit text. First generation Videotex systems are basically textual displays which break character positions into smaller portions and then use the character set coding scheme to color those smaller portions, thus creating mosaic graphics. In Telidon, graphics are transmitted by the use of Picture Description Instructions. The geometric elements of point, line, arc, rectangle and polygon are described on the receiver terminal display by sending a minimum number of signals which describe the elements. The receiving terminal contains the intelligence to interpret the signal and draw the graphic element at the desired place on the visual display and in the color requested (Bown et al. 1978)[1]. It is Telidon's focus on transmission of graphic images which provides much of the flexibility and potential of the system.

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Telidon's flexibility allows for better resolution screens at the receiving end. Normal television has a resolution of 200 x 256 lines but there are visual displays of 5000 x 5000 and higher. The same information coded in PDI's could be displayed on both screens. Of course it would appear finer on the higher resolution screen. All of the information is in the PDIs to draw the image more sharply but on lower resolution screens some of the information is automaticaly ignored. So if in a few years we all find ourselves with better resolution TV sets, we will still be able to use the same data bases.

It's easy to draw pictures on a Telidon display. Images can be drawn over one another, erased, moved, changed in color. Pauses can be built in to provide sense of animation although with telephone lines, speed of updating is not rapid enough for actual moving cartoons.

However, Telidon can be used with any type of telecommunications channel including telephone, microwave, satellite, dedicated television, cable or fibre optics. Some of these have the bandwidth to allow for rapid changes in pictures and which produce animation. A broadcast mode of transmitting Telidon as part of the normal TV signal was recently introduced by TV Ontario in Toronto on an experimental basis.

Telidon's PDIs allow a means of transmitting photographic images. At present this is done with black, white, 6 shades of grey, but up to unlimited shades of grey and colors are possible. Again the telephone line is the limiting factor with photographs appearing relatively slowly on the screen. Use of broadband lines such as two way cable or fibre optics would reduce this restraint significantly.

The Telidon terminal can function as a normal terminal and will potentially be able to receive on-line data bases such as bibliographic information or archival and encyclopedic information already resident in computers. At present developments have been completed to have broadcast news, which is prepared on-line, available and regularly updated on Telidon.

With the addition of some memory and a small amount of additional software the Telidon terminal could function as a storage and preparing device. The telephone connection is already inherent in the system, making connection with communicating networks easily feasible.

Because Telidon's original development was as a system for communicating graphic information, it is a relatively simple step for it to move to providing interactive graphic communication between people at different locations. There are two ways in which 2 or more people might wish to use Telidon. One concept is to use a common viewing space. Information from a central computer would appear on both screens at the different locations. With the addition of audio links, it would be possible to have education or other types of programs with displayed information that has been prepared in advance. The second concept is that of a common visual space. The same images would appear on each screen but the participants would be able to interact by changing the screen, drawing an added line, changing a color and so on. As each person draws on his screen, the changes appear on the other screen. This latter system has been demonstrated in the laboratories in Ottawa and has been used in various Canadian military projects.

Many of the possible services connected with Telidon have not yet been developed to the point that they can be manufactured. To some extent, which services are developed will depend on the needs expressed by users of videotex systems. Users priorities and their willingness to purchase various devices will determine which are developed first. All of these developments are possible and most have been demonstrated in the laboratories. Some additional developments are being considered. For example, we are still quite a long way from designing a terminal that stores, information about its user and "learns" to present just what the user wants but such devices have been conceived (Madden, 1979b)[3].

Interactive Videotex

Videotex services will perform many functions which will serve peoples' interactive or communication needs. An analysis of these interactive functions will help to fill in the view of what the future technological world might look like. The impact of this technological world on our culture and way of life is likely to be immense so it is important to have a detailed picture of what is technically possible. Of course, new technical developments occur each year; it is unlikely that we have thought of all the possibilities now. This framework will provide a way of analyzing new developments too.

Communication With A Computer

Before moving to the truly interactive or interpersonal functions that will be served by videotex systems, consider the interaction between an individual and the computer. The individual can perform several types of actions as he faces the computer terminal. He is interested entering data into the computer, in processing that data, in storing and later retrieving it, thus being able to find again what was stored, and in converting the data into a form for human consumption, either by himself or others.

Terminal equipment is developing to make the entry and consumption processes more convenient for users but there is much to be done in the design of equipment to make it truly comfortable. We have manual keyboards and display screens now commonly used; there are key punch machines, light pens, joysticks, for entry and touch sensitive panels for retrieval. There are also some machines which will read characters or pictures and store the data in the computer so the human has little tedious work to do in data entry but can concentrate on the creative process. Versions of terminal equipment for entry and consumption which are more compatible with human needs will be developed as the use of videotex becomes more widespread and demand for more convenient data entry and more aesthetic data output is felt. The one area of data entry that would be most convenient for users, entry by voice, will likely develop more slowly. There are now voice recognition systems where the computer can recognize different words and eventually we will likely be able to dictate a letter to a computer and have it typed.

As well as entering and consuming data, the individual when he faces the terminal is interested in storing information so it can later be retrieved. As long as he is content to store a small amount of information it is not a problem to label the data conveniently for retrieval, but as we all know, filing systems tend to become complex as the amount of filed information increases. There are a number of different retrieval systems now in use for bibliographic and other large data bases: tree-structured or hierarchical search structures and keyword searches, some with added and/or operators. None of these is truly convenient for users. Tree structures are simple to learn but very tedious to go through if there is a large data base. Keyword searches often produce more data than required or miss out important information. For many data bases the user must learn a new set of procedures which are simple enough but take time to learn and tend to slip from memory with infrequent use. The computer is unforgiving of spelling errors and lack of precision. Computer specialists tell us we will soon have relational data bases in which we can tell the computer to bring us information in a general area and then focus more specifically on what interests us. It remains to be seen whether these new retrieval mechanisms solve the seemingly intractable problem of how to organize the world's information so that it can be retrieved easily.

One more way in which the computer serves the individual user is by performing data processing for him. The computer can be told to restructure the format of a letter, to draw graphics from digitized data, to draw graphs from mathematical formulas, to perform statistical analysis, to change the dimensions of graphical representations as parameters are changed so that we can see the effect of the parameters on the moving graph. This function of computers is now relatively sophisticated. Once data is entered into a computer, whether it is text, graphic or numeric, it can be manipulated in many ways.

All of these functions data entry, storage, retrieval, processing and consumption, are necessary for the interactive communication processes to take place. All of these functions are either available now or can be added to Telidon terminals.

Interpersonal Communication Via Videotex

Interpersonal communication services are the real heart of Videotex as an interactive medium. An interactive communication service implies that people are separated physically but can use various telecommunications facilities to transmit and receive information. Various combinations of communicators are possible: many to one, one to many, person to person, group to group, and networks. Each of these combinations implies different types of services and uses the communications networks slightly differently.

Many to one communication. Most of the services now being developed for Videotex systems can be thought of as many to one communications. From the point of view of the user, many people are communicating to him. The individual with a Videotex terminal can retrieve information from a central data base which has been provided by many others. Services such as news, weathers and sports information; market, travel and community interest information are now entering Videotex data bases from many sources. Eventually these data bases could contain a full archives of human knowledge and the latest information about current events as well. Many on-line services such as bibliographic data bases will be connected to Videotex in the next few years. As well as the problem of retrieval systems mentioned earlier, there will be the problem of deciding what can be discarded and what should be retained in these data bases. Librarians, who now are influential in making these decisions for our information stored in books, may be called upon to assist.

One to Many Communication. From the point of view of the person providing information, the writer, artist or educator, Videotex becomes a one to many medium, a form of publication. The question is often asked "Will Videotex replace other forms of publishing such as newspapers, magazines and books?" That seems unlikely. Radio and TV did not destroy books and movies. In fact, in some cases there has been increased consumption in one medium when something was published in another. New media can also create new publications in another medium. Already new magazines are being published to review the contents of Videotex data bases.

Videotex systems provide the potential for each of us to become a publisher in a way that is generally not true with our other media. It should be relatively inexpensive to create a few pages for a Videotex system and have them distributed. However, it is not yet clear how, or whether, the mechanisms will be put in place for individuals to contribute to Videotex data bases and receive some form of royalties. Nor is it clear how such products would be marketed. The technical potential exists and if we as a society wish it, institutional arrangements could accommodate individual publishing.

Videotex systems also provide the potential for education programs which are personalized, can adapt to the learner's pace, and never get bored or impatient with the learner. Videotex aided learning could allow the best of human knowledge to be widely accessible. Going well beyond the programmed learning books, computer aided learning, most of it without graphics or with only very limited graphics, is making an impact in Ontario Community Colleges and in some other places. The possibilities of Videotex aided learning with Telidon are virtually unexplored but seem immense.

One to One Communication. Interpersonal communication between two people separated physically will also be enhanced by Videotex services. Messaging services are now part of many computer systems. One person may write to another or to a group of others and have the messages stored for later retrieval. These systems are especially convenient where large time differences exist such as between North America and Europe. Videotex systems soon to be used in field trials will include such messaging services but many other possibilities for person to person communication are possible with later Videotex. As noted above, Telidon will potentially provide a common viewing space where two people will see the same information drawn from a central archival store. They can then conduct education programs of many kinds or conduct business together. The common visual space in which each user can interact with the screen can be used for interactive games such as chess or checkers, for design projects such as building plans or community planning. A service can be envisaged where residents could look at the effect an adjacent new building will have on their own vista from various points of view. They might then be able to suggest changes to the new building and look at the effect of those. One to one services might be used for medical consultation as well. Medical consultation has already been performed at a distance using telephone interviews and video in some cases. Videotex services could enhance these consultations by providing a channel for text and graphic data to be transmitted. There are also programs in preparation which interview patients and consolidate the results so that the physician can then come to the centre of the patient's problem more quickly when the interview begins. These programs could be especially useful when patient and doctor speak different languages. When patients are handicapped or have difficulty reaching the physician's office, exchanges via Videotex between doctor and patient could provide daily contact without the necessity for real time interaction.

Group to Group and Network Communication.

Several people in many types of configurations will be able to communicate easily using their Videotex systems. Many such systems now exist using small computers with modems to hook up the telephone line. Both CB radio and ham radio have provided similar facilities in the past. The difference between each of these previous group to group and network forms of communication and the possibilities with Videotex systems is largely the availability of the equipment. If, as is envisaged, Videotex becomes as common as TV and telephone, then groups with common interests of all sorts, quite apart from interest in the technology itself, will be able to communicate. Many people have suggested that colleges of common academic interest will arise, but interests of many types could also be accommodated by Videotex.

Forces Influencing Videotex Development

There are forces of both impetus and restraint which are likely to determine the course of development of Videotex systems from what will soon be offered in field trials to the full range of possible future services. A major impetus to these trials is the rapid technical developments occuring throughout the industrial world. Many companies want to be part of the early technical developments in order to learn what will be required at an early stage. In Canada, field trials of Telidon are planned in at least seven locations within the next 2 years. A broadcast trial conducted by TV Ontario, began in January 1980.

Development costs for each new aspect of the technology provide a major constraint. If early Videotex services are well received and demand grows, revenue from them may allow for future developments. If early Videotex does not produce revenue, the probability of having the extra services is lower.

A major constraint is also the fact that both the technology and the services must be in place before any revenue can be expected. Start up costs are very high and this is reflected in the fact that large companies and governments are the major initiators of Videotex.

Another constraint is simply the time it takes to develop products. No matter how much talent is applied to development, thinking through good design takes time. Much of the development to be done is in the software, a very labour intensive product. It will be several years before the full range of Videotex developments are in place.

Although the major force of impetus in Videotex developments at this time seems to be the fact of the technical developments themselves, there may be another force acting on our society. As our lives become more complex we require more assistance to complete the tedious chores and we expect to use more information as we make decisions. Videotex may assist with some chores, such as income tax calculation, and promises to provide us with more information more easily to guide our choices.

Conclusion

This review of the potential for interactive communication has tried to bring some order to the often confusing list of new technical products. The framework of configurations of communicators provides a means of thinking about the uses of new technology. This review has certainly not covered all of the possible services. Major areas of new services, such as electronic funds transfer, have not been discussed.

Nor is there any review here of the second order effects that may occur once the technology is in place. Many writers have predicted the demise of the city with everyone working from home. Many are concerned about the implications for our privacy, and for employment. These are serious questions which deserve analysis. In my view, the full effects of Videotex will be felt slowly as the new developments are prepared and distributed. We have time to consider how we want these services to be implemented, what regulations and policies we wish to encourage to control them, while at the same time allowing full access to the new services. Basically, Videotex services appear to be a positive new technology that will enhance human performance and human communication. The challenge will be to work with the forces of impetus and restraint to create Videotex systems that best serve human needs.

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Note: For more information about
Telidon write:

Information Services,
Department of Communications
300 Slater Street
Ottawa, Ontario K1A 0C8

TELIDON AND EDUCATION

John H. Syrett
Project Manager
Telidon and Education
The Ontario Educational Communications Authority
Toronto, Ontario

Susan D'Antoni
Coordinator
Distance Education
Ryerson Polytechnical Institute
Toronto, Ontario

The OECA And Telidon

Telidon

Information systems that feature long-distance linkage of the computer and the television screen are already in operation on a limited basis in some countries. In Canada, the federal Department of Communications has developed a sophisticated version of such a system, Telidon, which combines alphanumeric text with an advanced graphics capability. (See also Dorothy Phillips' paper, The Potential of Telidon As An Interactive Medium.)

The OECA

The Ontario Educational Communications Authority (OECA) is a crown corporation in the province of Ontario whose policies and directions are determined by a 13-member Board of Directors appointed by the Lieutenant-Governor-in-Council.

It is OECA's legislated responsibility to produce and distribute programs and materials in the educational broadcasting and communications fields, and to engage in research in these fields. OECA's mandate is to provide educational opportunities to all residents of Ontario, regardless of age, level of education attainment or location within or outside conventional educational institutions.

The Project

As an educational broadcaster operating the TVOntario television network of 9 stations, the OECA naturally took an interest in the potential broadcast application of Telidon for education.

Telidon data can be transmitted in the vertical interval of the TVOntario broadcast signal to a potential 85 percent of the Ontario population. In this mode, the viewer will be able to select pages of information from a file of several hundred pages reflecting a variety of information sources, such as: news flashes, weather bulletins, stock market reports, educational resources and games, and tourist information. When the viewer punches in a number on the keypad, the corresponding frame will be electronically "grabbed" from the broadcast file for display on the screen.

It was anticipated that by January 1980, a host computer for the broadcast mode would be on site at the OECA, and up to 55 decoders deployed throughout the province for test purposes: some in private homes, others in schools, colleges, libraries, and other settings. Broadcast of a small 'magazine' of Telidon pages over the TVOntario network was actually begun on January 11, but the supply of user terminals has been delayed. All 55 should be in operation by late April.

The OECA has a special interest in exploring the systems implications of broadcast Telidon, but feels that it is important not to do so in isolation from other modes of transmission. In the interactive mode, a telephone link to a host computer gives access to many times the number of pages available via the broadcast link. This mode has the potential to access hundreds of thousands of pages.

To the greatest extent possible, the OECA will attempt to integrate the broadcast and interactive field trials in terms of joint use of facilities, interconnections between data bases, and evaluation. With these components in place, the OECA will attempt to demonstrate the complementarity of broadcast and nonbroadcast services.

Much of the hardware necessary for the conduct of these interrelated field trials of broadcast and on-line Telidon modes is on loan from the Canadian Department of Communications for the duration of the project. In brief, it includes the user terminals referred to above, two page creation terminals, a mini-computer to serve as host of the teletext (broadcast) system, and access to a second mini-computer containing the on-line data base. Project funding also supports the rental of the 1200-Baud modems required to link the user terminals with the "interactive" data base by phone line.

The Objectives

With these facilities, together with the terrestrial broadcast network of TVOntario and experimental direct broadcast satellite to remote sites in Northern Ontario, the OECA and associated educational agencies are seeking to provide a wide range of services suited to a variety of user needs and capable of affording a reasonable basis for evaluation of the system and of some of its applications to education. It is anticipated that in due course, the range of educational services provided will include:

TVOntario broadcast schedule
Background program information
Home viewer questions
Lists of support materials
Videotape catalogue listings
Curriculum-linked information/illustration
Programmed learning sequences
Appraisal instruments
Dissemination of project reports
Discussion questions
Updated information in specialized fields
Selected bibliography
Lists of available extramural and intramural courses
Off-hours delivery of educational materials
Calendar of conferences and other educational events
Career information
Educational games

It is of course not advisable to make hard and fast distinctions between "educational" and "non-educational" content. To the geography teacher, daily weather maps may offer better opportunities for meteorological studies than will programmed sequences. To the social studies teacher, news bulletins may be more serviceable as points of departure than current events digests. To the economics teacher, slightly delayed stock market quotations may be more useful than retrospectives. Accordingly, efforts will be made to include a range of general information in the data base:

News headlines and abstracts
Updated information in specialized fields
Weather and environmental information
Travel information
Market reports
Consumer information
Agricultural resource listings
Job information
Sports reports
Daily recipe/nutrition
New books
Referral services
Entertainment

The Consortium Approach

The OECA will work with other educational institutions in the development of educational applications. The Telidon field trial resources will be available for the creation, distribution, reception, and evaluation of these applications. Generally speaking, we look to conventional institutions for the creation and provision of computer-assisted learning (CAL) sequences since they have been active in this area for some time. Preliminary studies would indicate that computer-managed learning is also a concept that could be realized with the aid of Telidon technology. This concept differs from CAL in that the technology is employed by the teacher to assist students to assess their current mastery of units of curriculum.

It is not clear at this writing how successful the joint efforts of the consortium will be in creating the data base necessary to support services applicable at many different educational levels. Our reach will most certainly exceed our grasp. Indeed, if resources permit, we hope to experiment with captioning for the hearing impaired (broadcast mode) and with what is variously referred to as down-line loadings and tele-software, the concept of transferring programs from the computer to the memory of the user terminal where the user can access the contents at will without having to be concerned about gaining access to a line into the computer.

The Medium

In assessing the applicability of Telidon to educational objectives and the circumstance of the learner in or out of the classroom, the particulars of the medium must be taken into account. Recently, a panel of educators from a county board of education in Ontario summed up their first impressions of Telidon. They described it as a "computer-assisted information" system rather than a "computer-assisted instruction" system. With the addition of a keyboard to a user terminal, however, and with appropriate software in the computer, Telidon comprehends both computer-assisted instruction and information retrieval. With the upgrading of a user terminal to a transceiver capable of communicating with other transceivers without the intervention of a central computer, Telidon moves to yet another plane of activity, one freed from the confinements of mobilized, programmed, and stored intellectual responses. In due course, therefore, Telidon's ability to operate as a messaging device will add a tutorial dimension to the array of educational applications.

Whatever the intended applications, programmers of the system will need to come to terms with the display characteristics of the medium. At present, Telidon is designed to present not much more than 80 words on the screen. In the context of reading the television screen from your livingroom chair or sofa, Telidon is not a book or a newspaper. It conveys information, certainly; it communicates; but in Telidon language.

What "Telidon language" is will emerge as creative "designers" explore applications of the medium. From what this writer has been able to observe thus far, Telidon language will comprehend more than text and tables, and even these will be presented in relatively small increments, conveying meaning in economical terms, perhaps distinguishing discrete thoughts through changes in colour. Not only will the language tend to graphic expression and illustration, but there will be a degree of animation. Visual transitions, visual sequencing (over time) will underline the difference between this form of communication and the more static presentation characteristic of books, magazines, and newspapers. While the latter present language spatially, Telidon presents it in both space and time.

To recapitulate, what we have in Telidon is an efficient means of textual-graphic communication over distance. Tied in to micro-computing capability at the terminal, Telidon presumably moves closer to textual communication of a sort characteristic of the present generation of home computers, but its inherent character, in whatever hardware it finds expression, favours a special kind of language. That language, in turn, favours a "popular" curriculum.

It may be of interest to hypothesize what this means, in everyday terms. Is Telidon a sort of blackboard? Yes, but a better one. Is it a kind of slide presentation? Yes, but a more commodious, far-reaching, and responsive one. Is it a tabloid? Yes, in a way, but with newer news and older information. Is it a kind of letter? Perhaps more like a lot of postcards. Is it a conversation? Yes, but less time-sensitive, more sporadic, more deliberate. Is it a library? More like a portable encyclopedia. Is it a telephone? To the hearing-impaired, the best one. Is it a personal service? More of a coping device. Is it an entertainment? A source of intellectual play. All these attributes will go into the mix that will make person-to-person exchanges possible on a grand scale, encompassing everything from barter -- including learning exchange -- to electronic tutorials at a distance.

A popular and functional medium, then. And like all media, it needs the artist, and the artist's materials. In this connection, intuition suggests that a certain kind of writer is about to emerge upon the communications scene. A wordsmith alone will not do. A graphic artist alone will not do. The new breed of writer will have a sense of colour composition and spatial layout, a knack of using few words to maximum effect, and an imaginative grasp of how the juxtaposition of pages will have impact on the sensitivities of the Telidon user.

Prospects

Whether, in the short time available for the Telidon and Education field trial, participating schools, colleges, universities and other agencies can master both the artistic and educational design elements required to create effective applications, remains to be seen. What can be said with certainty is that the scores of demonstrations of the technology given to potential participants by the project team over the past year has revealed a quite extraordinary level of interest among educators inside and outside the province of Ontario.

Will Telidon make distance education -- all day, every day -- widely available? Will it present important search and retrieval opportunities to students? Will it fit the circumstances of group instruction in the classroom? Will it lend itself to remedial work for the individual? Will it motivate learning? Tune in next year.

Ryerson and Telidon

Ryerson was approached by the OECA Telidon Project in early 1979 to introduce the project and to request input concerning potential involvement.

A further meeting was held during the

late summer to bring the Institute up to date on the project and to request a more specific commitment in terms of potential activity.

Ryerson's interest in the Telidon Project is on several levels. First, Telidon has several direct applications for information dissemination, particularly for distance education. There is interest in the technology itself and its eventual evolution. Videotex, as a medium, has relevance for several teaching areas such as Graphic Arts and Library Arts.

Through an informal Working Group on Telidon, with wide representation from the Institute, an attempt has been made to explore the educational potential of Telidon from as broad a base as possible.

Ryerson

Ryerson Polytechnical Institute is Ontario's only degree-granting polytechnic, offering more than thirty career-oriented day programs of the diploma and degree level as well as a wide variety of credit and general interest courses through its Continuing Education Division and radio-based Open College. Total enrolment is some 32,000 full-time and part-time students.

While programs are structured and integrated to be relevant to the world of productive employment, they include a base in the humanities and a concern for academic excellence comparable to that found in the classical university. The objective of this blend of the practical and theoretical is to produce graduates who can both think and do, a concept which is embodied in the Ryerson Motto, "Mente at Artificio" -- with mind and skill.

In the tradition of the Massachusetts Institute of Technology, the ecole polytechnique and the polytechnic system in Britain, Ryerson's combination of work-place experience, classroom discussion and laboratory and studio activity demonstrates an approach to higher education which will meet the changing needs of our society.

Continuing Education at Ryerson offers a wide variety of learning opportunities for personal and professional development. Over 22,000 students enrol each year in courses leading towards a certificate, diploma or degree, or in courses for professional upgrading or personal enrichment. Courses are offered on campus in the evening, in-house and by correspondence or distance education.

Information Dissemination for Distance Education

As the only polytechnic in Ontario, Ryerson has a provincial mandate. The Distance Education Program is one means by which the Institute can extend its boundaries beyond Metropolitan Toronto to reach students who wish to take Ryerson courses or programs. Distance Education offers the adult learner a degree of flexibility which is not available in the traditional extension model. The learner is free to study when and where it is convenient for him and is not bound by the arbitrary schedules of the educational institution. Such flexibility is crucial to shift workers, women at home with young children, the person who travels as part of his work, as well as the handicapped, the shy or the impatient.

One of the main impediments to the optimal use of distance education is a lack of information. Without information about all possible educational opportunities, the potential learner is not in the position of being able to make an informed choice. The conventional paths that information about educational institutions travel are inappropriate and inadequate for correspondence education. Information about an institution may be disseminated by various means: the institution may advertise in local newspapers or on local radio or television stations; brochures may be placed in nearby public places such as bookstores, libraries, or supermarkets; directories of educational opportunities may be compiled and distributed by government agencies, or through direct mail; current or former students may pass on information to their family and friends. However, most of this dissemination will be limited to a specific narrow geographic area surrounding the institution, the area from which potential on-campus students are drawn. At best, as in the case of government directories, the information is most likely to be limited to one province as education is under provincial jurisdiction.

In a study undertaken in 1977 by the Canadian Association for Adult Education on behalf of the Secretary of State, it was found that the national newspaper was deemed the most efficient means of disseminating information about correspondence or distance education. Eight European countries were surveyed to determine how correspondence education systems contacted prospective students. The newspaper was found to be the primary medium in all systems. Two large open learning institutions, the Open University in Britain and the Fernuniversitat in West Germany, had undertaken formal studies to ascertain which of the media provided the highest level of awareness of the institution. In both studies, the newspaper was found to be most efficient.

Videotex should be superior to the newspaper for disseminating general educational information because information can be retrieved at any time and is easily updated. Accessible information about alternative and non-traditional learning systems means that the educational system as a whole can more efficiently serve the learning needs of the adult students.

Telidon with its potential for becoming a mass medium is ideal for the dissemination of information about distance education. For this reason, the first data Ryerson put on Telidon was descriptive information about the Distance Education Program. It was a very simple application: only four pages were developed. The introductory page incorporated a simple graphic and two phrases which highlighted the advantages to the student of distance education study. The following pages listed course areas and gave a contact address and telephone number for further information. Because the field trial will be centred in Toronto, a map locating Ryerson was included on the last page.

The creation of pages of general educational information is relatively straightforward and, therefore, not particularly time consuming. As well, the information can be updated easily and inexpensively facilitating the maintenance of current information. Perhaps videotex will not replace the educational calendar but it will certainly supplement it as a means of making information about educational programs widely and easily accessible.

Distance Education Network

The broad dissemination of information about educational opportunities is important to achieve optimal utilization of these resources. Equally important to prevent costly duplication of educational resources is the sharing of information among distance education practitioners.

The development of quality distance education courses is expensive, particularly if media such as radio or television are to be utilized. For this reason, the creation of similar courses in a number of institutions represents an unconscionable waste of resources in a period of increasing economic restraint. Inter-institutional transfer of credits has never been a particularly simple procedure. Presumably, the use by one institution of courses developed by another institution would be equally awkward however economically sound the idea might be in principle.

Joint course development by a number of institutions is one means of circumventing academic exclusivity. Although the process is often painful and usually more lengthy, the end result is a course which meets the needs of a number of institutions. Being used by a number of institutions, the course development costs will be ammortized more quickly through increased enrolment.

Such joint enterprises would be facilitated by an information network for administrators and faculty working in distance education programs. Ideally, information about existing courses, proposed revisions and anticipated course development could be made available for planning and development.

As a result of a Distance Education Workshop held in May, 1979, Ryerson and the Canadian Association for Adult Education are collaborating to set up such a network for Canada. It has been proposed that the most efficient means of making information readily available is on videotex. Since Telidon is at the present time being field tested, a model for an information network will be developed.

The first stage of building the network is to identify and contact all potential participants. To this end, a listing is being compiled which is based upon the mailing list developed by the previously mentioned Correspondence Education Project of the Canadian Association for Adult Education. Added to this list of five hundred individuals and institutions will be the participants of three recent distance education conferences.

Following the process of compilation, a mailing will be done to validate the accuracy of the mailing list. Persons contacted will be requested to respond if they wish to participate and to suggest other potential participants to broaden the network. They will also be asked to outline the level of information that would make the network useful for planning and development purposes.

A considerable amount of data was collected by the Correspondence Education Project and it is expected that this data when updated will provide the basis of a data bank.

Although Telidon is by no means a functional reality at this point in time, technology has a habit of catching up with us and offering a solution before we have articulated the problem. Therefore, the development of a network designed to use videotex as the medium for information exchange may rely on more conventional means for a time but hopefully, will be ready to put in place when the medium becomes widely available.

Vista Information Provider Course

Bell Canada is currently involved in the field trial of Vista, a videotex service which currently uses Telidon technology. The field trial will become operational in September, 1980, with 25,000 pages of information and the deployment of 1000 user terminals in the Toronto area. Faced with the need to train Information Providers to input data on the system, Bell approached Ryerson with a proposal that Ryerson develop and offer a training course.

A three-day course for six participants was subsequently developed and will run each week, beginning mid-April 1980. The course has been designed to progress from a general overview of videotex to a practical understanding of the Information Preparation System (IPS) terminal. An overview of videotex outlines the potential uses and the components of the system. The IPS terminal and its functions are then discussed in depth. Participants gain practical experience as each of the programs -- text, graphics and file manipulation -- is introduced. For each program, there is a comprehensive series of exercises designed to give course participants familiarity with all the elements built into each program. These exercises are performed on the terminal and, as the course progresses, participants build pages of information which serve as models. Finally, the design and production of an application is introduced and participants create and enter an application of their own design.

A three-day course will obviously not produce experts; as with any skill, expertise on the system will come only with practice. The course does provide the participant with a clear understanding of how the system functions and how to use it. With the aid of the detailed user's manual, which has been produced for the course, and the set of exercises, the course participant can review the system from both a logical and a practical perspective when he/she has data to enter on the system.

Future Directions

Ryerson is just beginning to explore the educational potential of Telidon. The projects which have been considered to date are those which will either provide immediate learning about the system from an institutional viewpoint or which have a direct application, taking into consideration the limited nature of the field trial.

The Information Providers course will, of necessity, change as the technology evolves. Research instruments have been built into the course to provide data about course participants -- who takes the course, what their expectations are prior to the course, and what their feedback is at the end of the course.

The exploration of the potential of Telidon for distance education is central to Ryerson's involvement. By working with the system in a number of ways -- teaching people to use the IPS terminal, teaching students about Telidon as a medium, and developing research projects as the model for an information network -- a greater understanding of the system will be gained.

There is a tendency to view a new medium in terms of existing media but we must look beyond. It is important to look at the medium objectively and to assess what its best role is of all the possible roles that are explored.

VIDEOTEXT AS A REVENUE PRODUCING MEDIUM

Charles Eissler
Manager, Product Planning
CATV Division
Oak Communications, Inc.
Crystal Lake, Illinois

Introduction

The purpose of this paper is to discuss Videotext as a revenue producing medium. We will be discussing Videotext as it may be applied to cable systems and to subscription television (STV is broadcast pay TV). These are the two areas in which Oak has a position as a system supplier and as a hardware manufacturer. These are our areas of expertise. Secondly, cable TV and STV can serve as vehicles for Videotext now without delay for agreement on standards for transmission or FCC approval.

Definition

Before going much further, we should explain what we mean by Videotext. When we use the word "Videotext" we will mean a set top adapter, headend or transmitter, hardware and software for:

- a teletext-type system
- transmission is one way either over the air or through a cable system
- information is transmitted and displayed through a television-type transmission as opposed to the use of hard wiring
- information is stored in a computer at the transmitter or headend and broadcast in sequential pages
- decoder memory adequate for storage of a single page
- a page display with 16 lines and 32 characters on each line
- capacity is about 800 pages
- maximum recovery time for a specific page is less than 3 minutes
- mosaic graphics

We are using the term "Videotext" to describe the application of this system to both subscription TV and cable system media.

Videotext Media

The revenue producing capability of Videotext will vary with the particular medium. Consider the situation of Videotext in 1. Commercial TV broadcasting 2. Subscription TV broadcasting 3. Cable TV.

It seems to me that the commercial broadcast operation has the least potential to generate significant revenue through Videotext.

The transmission of teletext-type programming over commercial TV must conflict with the main revenue producing mechanism of the station.

Mr. Joe Roizen of Telegen, the U.S. Representative of the French Antiope System, touched on these conflicts in the course of a presentation to the Society of Cable Television Engineers earlier this year. He mentioned that one of the reasons that Teletext has been so slow to develop in this country was the concern that viewer attention would be diverted from commercial messages of a broadcast station.

Mr. Roizen also made the point that the United Kingdom with a license revenue supported television broadcast system, was not dependent on commercial advertising. This provided the environment in which the Teletext system could develop.

There is a second factor which could make Videotext a poor revenue producer for a commercial broadcast station. Much of the information which may be of interest to a teletext subscriber is already included in the programs which the station broadcasts. Consider the staged news program, for example. Certainly, the news is a major attraction for viewers. If that station also presented news in Videotext format, the subscriber could conceivably get the item from Videotext ahead of the staged news presentation.

The viewer could absorb this news item while the station staff was still preparing and staging the presentation for the regularly scheduled broadcast.

Videotext may have a role as a reference information service of a commercial broadcast station. Although this service may keep viewers focused on the station, it is not likely to produce significant additional revenue.

The situation is different with subscription TV. Subscription television broadcasting provides an excellent climate for application of Videotext. The subscriber is already paying for something beyond normal commercial fare. The premium program content of STV is oriented to entertainment. The informational content of the Videotext library presents no conflict with the normal STV program. There is less conflict with the revenue producing mechanism of the operation.

The Videotext service also provides the STV station with the opportunity to include more local information in the station program. One of the advantages of an STV operation compared to the premium program offered by cable is that it can provide programming more closely aligned to local tastes than is available from the satellite feed prepared for national consumption.

A second factor is that an STV station with Videotext can become more competitive with local cable operation. Many cable systems provide a number of channels of text information to their subscribers. This text information can include:

Time
Weather
News ticker
Stock ticker
Sports ticker
Channel program
Sports news
Sports scoreboard
National weather
Regional/marine weather
Entertainment guide
Shoppers guide
Community bulletin board
Movie guide
TV swap meet
Message wheel
Comparison shopping

Videotext provides the means by which an STV station can also offer these important consumer-oriented services.

The subscriber base of STV is modest today, however, it is on the knee of the curve of rapid expansion. Currently, there are about 400,000 subscribers in the six cities that have STV operations. Three of these have been operating only a few months. The STV station in Los Angeles has 250,000 subscribers after about 2½ years of operation.

An STV operation can break even with 30 to 40,000 subscribers. A rough guideline for market size to sustain an operation is 400 to 500,000 TV homes. There are 51 markets in the U. S. with more than 400,000 TV homes.

Included are 18 markets with more than 800,000 TV homes. These could support more than one STV operation.

Roughly 5,000,000 subscribers are forecast by 1985 and over 9,000,000 by the end of the decade.

Cable television is a medium which can also make excellent use of Videotext. Cable television can offer many text-type consumer services as we indicated earlier. However, the cable system must devote a number of separate channels to do this. One cable operator that I talked to recently estimated that he would save about 14 channels when he installs a Videotext system. He anticipates that he can retain all of the services that he currently has. He will also be able to add more text information to his system with only one channel dedicated to a Videotext program. The channels, thus, freed up will be available for other video uses. These uses can include more tiers of premium programming for additional revenue. Some of the liberated channels could be released to municipal services. Channel capacity and availability for municipal services are hot items in present day cable TV franchise negotiations. The availability of a Videotext service should strengthen a cable operator's position in franchise operation.

CATV has been collecting subscribers for 30 years. CATV has over 15,000,000 subscribers today. Growth has accelerated over the last several years. One of the main reasons for this acceleration is the premium TV programming available via satellite. About 4½ million cable subscribers take these premium programs. CATV subscriber growth is expected to double over the next five years for a total of 30,000 by 1985.

Basic Requirements of Videotext

Videotext needs to be thought of as a new communications medium. If it is to be a significant revenue producer, it must do some things better than they are done by existing media today. Videotext cannot just be different. Videotext must present added value to the consumer. Even within the friendly confines of STV and CATV it must be a consumer benefit.

Here are threshold criteria which must be met by Videotext to be successful:

1. It must have a fresher news and informational content than a newspaper. These pages must be updated throughout the day.
2. The response time must be faster than the time required to find the phone book and locate an item in the yellow pages.
3. It must include local and area news in addition to a national feed.
4. It must supplement text information with graphic illustrations.
5. Advertised items must be of such interest to the viewer that he seeks it out willfully.

Videotext Market Dimensions

In order to illustrate the revenue producing potential of Videotext, consider the following sales forecast for STV and CATV growth in the 80's:

STV/CATV SUBSCRIBER FORECAST

Year	*Total Subscribers STV (1,000's)	CATV (1,000's)	Combined (1,000's)	% Total TV Homes
1980	400	15,000	15,400	20
1	650	17,550	18,200	
2	1160	20,400	21,560	
3	2850	23,750	26,600	
4	3700	27,500	31,200	
5	5000	31,600	36,600	44
6	6500	34,800	41,300	
7	7500	37,900	45,400	
8	8300	40,900	49,200	
9	8800	43,800	52,600	
1990	9300	46,700	56,000	60

* Jan. 1 of year

About 36,000,000 TV homes would be candidates for Videotext service by Mid 1980's.

Videotext Revenue Stream

Revenue from Videotext will result from the following:

1. Sale of hardware to STV and CATV systems. This will consist of headend or transmitter site components as well as home decoders. We are assuming that the decoder will be purchased by the system operator and will remain his property while supplied to the Videotext subscriber. At some future date, after considerable product maturity, a Videotext decoder could become a consumer purchased item.
2. Sale of software programs to Videotext service suppliers will be another source of revenue. The software programs will also interface external sources with the Videotext library in the computer.
3. Sale of advertising space in the Videotext program. A software program will enable the advertiser to present his information in a format optimized for Videotext.
4. Subscriber payment for the Videotext service.

Headend equipment to outfit a cable system or STV station for Videotext will consist of the following:

1. A color graphic keyboard to compose Videotext pages.
2. A data system to interface external information such as newswire, weather and to compose the material into a Videotext page.
3. An IBM series 1 computer to provide archival storage of Videotext pages.
4. A data controller to take information from the computer and put it in sequential format.
5. The equipment to modulate the STV transmission or the cable channel and thus send the Videotext pages out over the system in sequence.

A rough estimate of the cost of this headend equipment is $100,000.

Decoders will also be a cost item to the business providing Videotext service. Please recall our assumption that, at least in the early years, the decoder would remain the property of the system operator. Decoder cost is estimated at $400 for the first couple of years. Increased volume and product maturity should reduce decoder costs substantially in subsequent years. It seems reasonable to assume a $250 cost by 1985 and further reductions to $150 by 1990.

Our next assumption concerns the rate at which decoder production might grow and the affect on cost due to product maturity.

FORECAST OF DECODER PRODUCTION AND COST

Year	Production (1,000's)	Cumulative (1,000's)	Decoder Cost
1980	1	1	$400
1	20	21	
2	50	71	350
3	100	170	
4	200	370	
5	400	770	250
6	800	1,570	
7	1,200	2,770	
8	1,600	4,370	150
9	2,000	6,370	
1990	2,500	8,870	

Our forecast of 8,870,000 Videotext users by 1990 would be about 16% of the STV and CATV subscriber base.

The revenue which would be generated by sale of decoders (under our set of assumptions) is illustrated below.

REVENUE STREAM FROM SALE OF DECODERS

Year	Annual Sales	Cumulative Sales
1980	400,000	400,000
1	8,000,000	8,400,000
2	17,000,000	25,900,000
3	35,000,000	61,000,000
4	70,000,000	131,000,000
5	100,000,000	231,000,000
6	200,000,000	430,000,000
7	300,000,000	730,000,000
8	240,000,000	970,000,000
9	300,000,000	1,270,000,000
1990	375,000,000	1,650,000,000

The revenue stream from sale of decoders will exceed 1.5 billion dollars in this decade.

The second source of revenue from Videotext mentioned previously was the software program to format pages. This will be especially important in the application of Videotext to advertising. The mosaic graphics and 16 color variations possible in the system will allow effective illustration of pages. The illustrations will be less detailed than a normal television picture; however, the pages can be effective when handled by a professional graphic illustrator. Just as ad mats are made up by advertising agencies for client use in newspaper advertising, Videomats will be made up for Videotext advertising.

So far we have spoken of the revenue that we expect to be generated by sale of Videotext hardware to the STV or CATV operator. We have been looking at the business from the hardware manufacturer's point of view. Now consider the system operator. He will have two main sources of revenue. These will be:

1. Subscription fees for the Videotext service.
2. Revenue from advertisers.

The system operator will earn the subscription fee by virtue of the informational content of his library. If Videotext is to be worth the subscriber fee, it must include things like:

1. News update when the viewer wants it.
2. Weather, updated several times daily.
3. Weather in other areas.
4. Stock market update.
5. Sports score update.
6. Local news and announcements which may be covered infrequently by other local media.

The advertising program that will succeed on Videotext, will have to recognize differences from other media. The subscriber will have to make a decision to seek out the advertising message before he is exposed to it. Certainly this is different from regular commercial TV. On commercial TV, the advertiser makes an impression on the viewer when his message is given during the commercial break between program segments. As subjects, we know these impressions are numerous. In the case of printed advertising, much the same kind of impression is created as the reader leafs through the pages of his magazines or newspaper. But with Videotext, the subject must want to see that page or it will never appear. The Yellow Pages are a somewhat comparable situation in that the user must seek the advertising message. However, Videotext will be capable of frequent update and graphic illustrations.

The convenience of accessing Videotext advertising will make it an excellent medium for things like:

Restaurant guides
Theater guides
Airline schedules
Weekend resorts

The convenience and speed with which ad content can be changed is a dimension of the Videotext niche in the market. A merchant can be equipped with a remote terminal and modem. He will have the ability to call up his ad page (or pages) in the Videotext library. The merchant can then revise the ad according to his business strategy at the time. Incentives for immediate customer response can be included to encourage attention to Videotext advertising.

The Next Step

We will not attempt to quantify the revenue stream from Videotext subscriber fees and advertising. The consumer has yet to be consulted. It's not that the jury is still out. It would be more accurate to say that the case is not in court yet. We will be conducting a market test using STV as the vehicle to bring Videotext to a large number of subscribers. We expect to include informational programs as well as advertising messages. This will allow potential subscribers and advertisers to appraise this new medium and to respond to questions regarding its value. We expect to complete our test in at least one market by the middle of this year.

Videotext will improve with age. Decoder memory will increase and allow storage of a series of pages. Educational application of the medium will increase with memory. We are convinced that in the environment of the free enterprise system, Videotext will find a permanent niche as a viable revenue producing media.

INTERNATIONAL POTENTIALS
OF
COMPUTERIZED CONFERENCING[1]

Murray Turoff and Starr Roxanne Hiltz
Computerized Conferencing & Communications Center
New Jersey Institute of Technology
323 High Street
Newark, N.J. 07102

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ABSTRACT

Current experience with computer based communication-information systems is projected to more widespread international uses such as the exchange of scientific and technical problems and solutions, conflict resolution, and the management of crises such as famine or terrorism. Artificial price hikes and other prohibitive regulations as well as a lack of understanding of the dynamics of inter-cultural communication in this medium are the major barriers to international applications.

INTRODUCTION

The concept of the 'information society' has perhaps become 'old hat'. So much has been written about it that we may have convinced ourselves that we understand what it means and how it will shape the future. However, when one leaves the realm of generalities and focuses in on specifics, one's sense of certainty becomes largely illusory. In no single area is this perhaps truer than when we are dealing with interactions between information societies. In this paper we will disregard the scant empirical evidence and bravely or foolheartedly step out on the "ice" of conjectures about what the international arena will be like in the coming "information age" of computer mediated telecommunications.

Our intention is to base these conjectures on some substance, however nebulous. We therefore will draw on a microcosm sample of an information society to extrapolate the potential opportunities, alternatives and consequences of a future 'wired world'. Our basis of experience includes four years of operational field trials of an experimental computerized conferencing system, tying together approximately seven hundred individuals in the U.S., Canada and a number of foreign countries. In January of 1980, EIES had about 30 non-U.S. members, including seven from Switzerland and three each in Sweden and Austria. There were none from developing nations because they currently lack TELENET ports to make the international connection. Though there has been some international use, we will thus have to rely mainly upon intra-national experiences which may be generalizable to international applications. In addition, we have some initial results from controlled experiments in group communication and problem solving in face to face versus computerized modes.

The system we will use as a prototype is called the Electronic Information Exchange System (EIES). It represents a joining of a communications space and an information space in one coherent man-machine interface designed to allow access to a vast computer resource and network by individuals with no prior computer experience or expertise. We will assume basic familiarity with the technology in this paper, and concentrate only on a delineation of characteristics and applications which are particularly relevant for international communications. (See Hiltz and Turoff, 1978, for a complete general overview of the technology, its applications, and impacts). We will make some initial generalizations, and then turn to current case studies and empirical observations on the impacts of the use of this technology, and finally suggest some possible or probable international applications in the next decade.

Information is "the message of human experience" (Becker 1978) which has a content, a medium of communication, a sender and a receiver. The medium can, in some cases, be more important than the content in determining the impact upon any decisions or actions of the recipients. Equally important are the perceptions the senders and receivers or exchangers have about one another and the degree to which they share or do not share a common base of knowledge. It is quite clear that the relationships between nations and the actions of nations through their leadership have historically been influenced by these factors. Whether it is the negotiation of a commercial agreement, the settlement of a conflict situation or a crisis management operation, the results often turn upon factors of psychology, sociology, culture and technology.

The introduction of the computer as a facilitator of a human group communication process means that all these concerns come into play. It further means that the communication process can be intentionally designed to control these factors to a far greater degree than possible in other communication media. Our purpose in this paper is to look at the differences between face to face meetings and human communications facilitated through a computer, and to infer from this some of the more crucial impacts on common objectives of international communications such as negotiation, persuasion, information exchange, consensus formulation, conflict resolution, problem solving and crisis management. We do not, of course, propose that this new medium might replace the dramatic summit meetings at the top level or treaties and fundamental agreements. We do suggest that it might supplement some meetings, allowing a wider channel of continuous communication for the preparation and follow-up on face to face negotiations and the daily administration of the details of international cooperative meetings. We also feel that it can make possible many more ongoing cooperative efforts by trans-national working groups than is now possible with other available communications media.

But first, we shall fall prey to the explorer's tendency to describe a whole continent on the basis of a limited expedition, and share our visions of an international information anarchy a decade hence. There will be a tremendous computer capacity available in all industrialized nations, and even in many that are not industrialized in the traditional sense. The capacity to transmit data and communications in vast quantities and at low cost will exist. Whether the low costs will be realized is more of a regulatory and political question than a technical one. Information and data will take on the characteristics of a commodity as basic as money or energy. The electronification of information will mean that its value or worth in currency can be easily pinpointed and marketed. Concerns about information flowing out of countries have already reached the point where regulatory barriers are being adopted in some countries. One can easily imagine the same controls and superstructure imposed on the flow of information that nations have imposed on money, though it is probable that this will be even less successful than is the case for money. The realities of the technology are such that any individual having access to a phone line to an information system will be able to capture in electronic form anything to which he or she has access. Such concepts as copyrighting will suffer from the same difficulties that the citizen with a video recorder presents to the producer of TV programs. People and organizations with information and communication facilities to market will gravitate to whichever countries offer the least restrictions on their international operations. This of course has its analogy with the flags flown today on the majority of the tankers that ply the sea lanes. All things considered, we are likely to go through a period that can be characterized by 'information wars' as opposed to 'trade wars'.

Nations will be faced with the fundamental choice of capitulating to information technology or fighting it by trying to apply outmoded regulatory concepts and artificial controls. It is our belief that the latter approach would be comparable to cutting off one's nose to spite one's face.

Having made these sweeping introductory generalizations, we will attempt to summarize what is known and what has been observed in the utilization of computer technology to facilitate human communication. This will serve as a basis for extrapolation to specific international communication objectives.

FACTORS IN COMPUTERIZED CONFERENCING

TECHNOLOGICAL FACTORS

The concept of utilizing a computer for facilitation of human communications introduces two key technological elements that make this form of communication distinctly different from other forms. The electronic equivalent of a group memory allows people to be non-coincident in time as well as space. It also allows individuals to interact at their own rate in terms of reading at their own desired time and speed and deciding when they wish to respond and how fast they need to compose that response. Furthermore, it means individuals can join a communication process after it has started and not miss out on what has taken place.

Secondly, the logical and computational processing possible within a computer means that the actual protocols of the communication process can be tailored to the application, and that the historical record can be organized in whatever data retrieval structure makes sense for a particular objective. Perhaps most importantly, it eliminates for the people involved the bookeeping chores associated with any group communication process. The computer can keep track for each individual of what is new or of interest for him or her. The result is that the communication process can be tailored around a particular application just as a parliamentary or judicial set of protocols are utilized to tailor a coincident face-to-face group for a particular objective. No other form of remote communication that has been available to date has allowed this flexibility common to coincident groups.

Many otherwise impossible mechanisms for structuring communications occur with such a system. Communications can be addressed by content as well as by individual, allowing discussions to be self organizing both with respect to content and participants--the content can be the address. This feature alone holds tremendous promise for utilizing systems with large populations of users. It also implies a possible fluidity in the nature of human groupings that has never before been possible.

In the following sections we have chosen our examples to highlight the fact that a computerized conferencing system emphasizes structuring of both the communication and information process. Terms commonly used in the current literature like "electronic mail" are highly misleading in that they conjure up merely the process of automating a letter. To view any computerization as a mere automation of what has been done before is the height of naivete with respect to understanding the future of these systems. In essence, we can now do remotely most things that face to face groups have been able to do and there is every promise we may be able to do them somewhat better. It is the resulting changes in psychological and sociological processes that make the real difference.

SOCIAL AND PSYCHOLOGICAL FACTORS

In any negotiations involving such matters as arms control or a political crisis that threatens to escalate to military action, it is crucial that the parties be able to:

1. Exchange information accurately and comprehend it

2. Give and review orders

3. Gain trust in one another; the converse of this being to know if the parties are attempting to lie or mislead

4. Be willing to change their attitudes or opinions as a result of the negotiations

Many people who have never used a written form of communication or an interactive computer system might intuitively dismiss computerized conferencing as totally inferior to face to face negotiations for any such crucial interactions, and feel that the non-verbal cues in face to face interaction are necessary in order to facilitate the resolution of the conflict. The fact is that these intuitions are wrong. The experimental evidence indicates that media which decrease or eliminate the non-verbal cues can be at least as effective. Briefly summarized, here is some of the evidence:

1. In our current research we have asked both face to face (FTF) groups and users of EIES (CC) to solve two problems and to rate the media on a 1 to 7 scale. We have found no differences in the quality of solution of a task that has a "correct" solution to serve as a criterion. In a qualitative human relations task, we found similar solutions, except that CC groups were less likely to decide on negative sanctions and more likely to decide on "face saving" solutions for both parties in the conflict situation. (See Hiltz, Johnson, Aronovitch and Turoff, 1980 for a complete account of the controlled experiment and the findings.).

2. Davies (1971) compared face to face and teletype for the communication of factual information. Teletype was found to be the more effective mode.

3. Comprehension is generally found to be better with the written word (Toussaint, 1960). This may be because the written channel allows the possibility of rereading or checking difficult passages. (Short, Williams, and Christie, 1976, p. 84). In our controlled experiments, problems were seen as significantly clearer in the computerized mode as compared to face to face groups.

4. Written media are capable of introducing MORE, rather than less, attitude changes. Wall and Boyd (1971) presented subjects with a face to face, a videotaped, and a written message. The written message produced more attitude change than the other two media. In our experiment, however, we found no difference between the media in amount of opinion change.

Short (1972) had 30 pairs of subjects discuss controversial issues face to face, on closed circuit t.v., or loudspeaking telephone. An initial questionnaire was used to select pairs of subjects who disagreed. Medium of communication had no effect on the ability of the disputants to reach agreement. However, as measured by a post-discussion questionnaire, there was "significantly more opinion change in the audio condition than in the face to face condition with the video condition intermediate... Removing the visual channel (making the situation more anonymous) could be taken to decrease the loss of face associated with yielding; in this way there might be less 'opinion change' in the face to face condition where perceived commitment of one's initial position is higher". (Short et. al, 1976, p. 104). This finding has been replicated in four subsequent experiments.

"Lying" and its detection are particularly interesting. Reid (1970) had a speaker alternately lie and tell the truth at randomly determined 30 second segments. A subject sat and received this face to face, and a second subject received audio only. There was no difference in the ability to perceive lying; however, the face to face listeners THOUGHT that they could tell lying better.

While there is no doubt that a written mode of interactive communication represents a loss of non-verbal cues, it could very well be that this is a good thing. Non-verbal cues frequently detract from a participant's ability to focus on the cognitive content of what is being sent and received. Furthermore, cross-cultural differences can lead to the misinterpretation of non-verbal cues.

Goffman (1955) has written extensively about the "face work" that goes on in face to face behavior. He defines this as "the positive social value a person effectively claims for himself, ... and image of self delineated in terms of approved social attributes... A person tends to experience an immediate emotional response to the face which a contact with others allows him; he cathects his face; his 'feelings' become attached to it." (pp 5-6).

In a computerized conference, participants seem able to "let down face" in terms of their overt behavior (see Hiltz, Johnson, and Agle, 1978); and conversely, to be able to consciously control the emission of the "cues and clues" given to others (see Kerr and Bezilla, 1979). Without the necessity to constantly worry about the impression being made by one's facial expressions or other physical cues being "given off", in other words, a participant is potentially freer to concentrate on the content of what is being communicated.

One example of non-verbal communication which interferes with the ability of people to communicate effectively when they are from different cultures is the preferred conversational distance of South vs. North Americans. In Latin America, the conversational distance preferred is much closer than is comfortable for North Americans; what is felt to be comfortable by the Latin American is likely to be subconsciously interpreted as aggressive or sexual by the North American. (Hall, 1959). Likewise, the Japanese never overtly disagree in face to face meetings; it would be interesting to experiment and see if they would express disagreement in a written mode.

This is not to say that all of the evidence indicates that computerized conferencing might be more effective than face to face meetings for international interactions; but it certainly indicates that it warrants some trials and experimentation. It should also be emphasized that it takes at least several hours of learning and practice time for people to become comfortable and effective with communication via computer. When they first sit down at a terminal, they can barely communicate at all. Moreover, our field trials and experiments indicate that groups which are distrustful of one another and who do not wish to cooperate simply avoid using the system. A high degree of motivation is thus a precondition for successful applications.

SPECIFIC EXPERIENCES

What we are going to try to illustrate in the next few sections is that experience with EIES indicates that both the standard and "custom structured" communication-information features can be successfully used for many tasks that involve cooperation or conflict-negotiation among participants in several nations. These tasks include coordination of plans for cooperative ventures, writing of joint reports, the construction of a stored dictionary of accepted meanings for terms that are being used for negotiation, technology and knowledge-resource sharing, and crisis management. Some of the technical capabilities illustrated in these examples have not been explained in the very brief overview of EIES included in this paper; for further clarification, see Hiltz and Turoff, 1978 and 1980.

INFORMATION EXCHANGE: LEGITECH

> There is an increasing need for a trend away from competitive international strategies and towards cooperative strategies. Given the major resource interdependencies, currently typified by global dependence on oil-exporting countries, there is little alternative to cooper-

> ative strategies. Policies that lead to a widening of the economic gap between developed and less developed societies are likely to lead to dangerous instabilities. As the global economy changes to an information economy, the knowledge of each society could be shared for mutual benefit, without loss to the sharing societies. The result of such an exchange would permit continued improvement in the rate than would otherwise be possible. This conclusion follows from the nature of information; the more of it you share the more you have left at the end of the transaction. This is because information exchanges lead to improvements in the quality of information, rather than a loss of information. The information game can be played on a global scale as an 'everybody wins' game, rather than the 'winners and losers' game that is played with material resources. (Parker, 1976 pp 14-15).

A current model of such international knowledge resource-sharing is provided by the "legitech" group now on EIES. This group consists of 20 state legislative science advisors and approximately thirty resource organizations.

The members of this exchange enter "inquiries" which are a maximum of three lines in length. Other members then decide whether or not to "select" the inquiry. If they do not choose it, they have filtered out receipt of all further information or exchange on the topic. However, they can search the alphabetical list of inquiry-topics at any time and select the topic. Thus, among the fifty members of the exchange, only those interested in a specific topic among the hundreds that have been entered are participating in the additions to and retrieval from that specialized data base of current information on the topic. This kind of scientific information exchange would probably be a good mechanism for the dissemination of knowledge to developing nations. This figure shows an actual interaction in an exchange, including an initial attempt to retrieve a keyword not in the index. The inquiry on "biomass" was answered by responses from Hawaii, California, Oklahoma, Massachusetts and several resource organizations (the American Society of Mechanical Engineers and the National Bureau of Standards). Note that an individual within the responding organization usually signs the response. While states are not exactly sovereign nations, the fact that they have found it possible and fruitful to exchange their science and technology-related problems and knowledge via EIES suggests that a comparable model on an international level would also be possible.

When a LEGITECH member signs onto EIES, he or she receives a special menu of choices geared to this information exchange function. Figure one shows a printout of some typical items.

Figure 1
Interacting with Politechs-Legitech

```
Welcome to Politechs, whose current exchanges
include:

     Publictech (pt) & Legitech (le); message
PSI (700) about others.

Welcome to the PUBLICTECH Exchange.

As of 2/26/80  11:15 PM there are 139 topics
and 508 responses in PUBLICTECH.

REVIEW HOW MANY ITEMS WAITING (Y/N/A)?n

PUBLICTECH EXCHANGE CHOICE?

ACCESS TO:
    TOPICS/INQUIRIES                  (1)
    BACKGROUND/RESPONSES              (2)
    YOUR SELECTION OF TOPICS          (3)
    ALPHABETIC INDEX OF TOPICS        (4)
    TOPIC MEMBERS AND MARKERS         (5)
    MEMBERS OF THIS EXCHANGE          (6)
    GROUPS IN THIS EXCHANGE           (7)
    MONITOR OPTIONS                   (8)
    OTHER EXCHANGES                   (9)
    EIES                              (0)

PUBLICTECH EXCHANGE CHOICE?4

INDEX CHOICE?

DO YOU WISH TO:
    GET FULL ALPHABETIC INDEX         (1)
    GET ABBREVIATED INDEX             (2)
    ADD KEYS TO TOPICS                (4)
    DELETE KEYS FROM TOPICS           (5)
    RETRIEVE TOPICS BY KEYWORD        (6)

INDEX CHOICE?6
KEY (KEY/KEY PART/AAA-ZZZ)?biomass
TOPICS ARE INDEXED UNDER THE FOLLOWING KEYS:
  BIOMASS.  SEE UNDER AGRICULTURE:BIOMASS
KEY?agriculture:biomass
Topics indexed under AGRICULTURE:BIOMASS to
which you have access:  52
To get these topics, enter:
Y (topics only), H (topic headings only), R
(topics + responses), or N (no).
GET (Y/H/R/N)?y

PUBLICTECH T52 DAVID L. JONES (HIPED, 755)
```

10/10/79 2:01 AM
KEYS:- /AGRICULTURE:BIOMASS/
TOPIC: BIOMASS AS ENERGY SOURCE

To what degree is your state/country/ community involved in developing biomass energy, either from waste materials or from crops grown for the purpose?

Some Sample Responses to an Inquiry

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PUBLICTECH EXCHANGE CHOICE?2

RESPONSE CHOICE?

DO YOU WISH TO:
   GET FULL TEXT OF RESPONSES      (1)
   DISPLAY TITLES OF RESPONSES     (2)
   COMPOSE/ADD RESPONSES           (4)
   MODIFY/DELETE RESPONSES         (5)
   REVIEW RESPONSES                (6)

RESPONSE CHOICE?1
TOPIC/INQUIRY (#)?52
RESPONSE (#/#-#)?1-5
```

PUBLICTECH T52R1 DAVID L. JONES (HIPED,755)
10/10/79 2:10 AM
RESPONSE: BIOMASS FOR ENERGY IN HAWAII

Hawaii has strong interest in developing biomass as an energy source. The City and County of Honolulu (embracing the Island of Oahu) has begun actively evaluating bids/ proposals for installation of facilities for conversion of solid wastes from garbage/trash collections to energy, probably methane/ methanol.

The State Department of Planning and Economic Development, the State Department of Agriculture, and other agencies are also studying various crops which might be grown for biomass energy conversion. Under consideration are sugarcane, corn, forest products (including varieties of Eucalyptus and Leucaena), kelp, and others. Different conversion methods, processes, and products are also being investigated for the best combination of maximum energy output, minimal energy input, minimal effects on the environment, etc. End products may be ethanol, methane, methanol, hydrogen, fuel pellets, direct heat by burning, etc.

PUBLICTECH T5R2 VERNER R. EKSTROM (OKLEG,715)
10/11/59 7:20 PM
RESPONSE: OK AND BIOMASS

At the present time the OK Legislature has formed a special subcommittee on alternate energy sources to look into the potential of biomass energy. For further information contact Lisa Barsumian, State Legislative Council, 305 State Capitol, Oklahoma City, OK 73105. 405/521-3201
Tom Clapper - Legislative Researcher

PUBLICTECH T52R3 VERNER R. EKSTROM (OKLEG,715)
10/12/79 11:34 AM
RESPONSE: /ENERGY-BIOMASS/

Oklahoma City is currently attempting to assemble package to use municipal solid waste in combination with the liquid waste from agribusiness (meatpackers) plus whatever makeup liquid is required from the municipal sewer system for co-digestion in bacteriological digester to produce methane as one of the output products. This project is rather unstable as the number of participants is large, the dollars spent to date are small, and the only local methane generator has been subject to criticism for several years on the basis of odor.

This same system can work with any other sort of biomass that is postulated, and the same sort of problems will come out of the woodwork. In any of these systems be sure to establish who is responsible for the residue. Chimo, Jim/OKC

PUBLICTECH T52R4 J.M.WYCKOFF/D.CUNNINGHAM
(NBS,744) 11/19/79 2:06 PM
RESPONSE: BIOMASS CONTACT

".TEXT" THE NATIONAL BUREAU OF STANDARDS IS NOT DOING WORK INVOLVING BIOMASS AS AN ENERGY SOURCE. HOWEVER A GOOD CONTACT FOR THIS INFORMATION IS SOLAR ENERGY RESEARCH INSTITUTE, DEPARTMENT OF ENERGY, 1536 COLE BLVD., GOLDEN, COLORADO 80401 (303) 234-7171. THE SOLAR ENERGY RESEARCH INSTITUTE HAS RECENTLY COMPLETED A SURVEY ON BIOMASS GASIFICATION, SO IT MAY BE GOOD TO CONTACT THEM FOR FURTHER DETAILS.

PUBLICTECH T52R5 RICHARD BRANDSMA (CAASY,714)
12/6/79 1:46 PM
RESPONSE: BIOMASS

The Calif State Energy Comm, Development Div (916-920-6033), is developing a program whereby it funds private energy producers to convert to burning ag and muni wastes. The funds will be recovered by payback over a period of time. (I will forward some material in the mail.)

The Calif State Solid Waste Mgmt Board is involved, to a large degree, in Bio-Mass energy application. It has one major facilcity in Eureka, CA which, in 1983, will be processing 1500 tons of wood waste and 300 tons of muni waste per day... *****Tom Buckles*****

The Legitech operation is a good example of a tailored subsystem within the EIES system designed for a group sharing information. While each state legislature is independent, there is a recognition that they have meaningful information to exchange both of a factual and of a lore nature. In fact, one of the revolutionary aspects of integrating communication and information functions into one system (Information Exchange) is the unique ability to handle transitory lore and subjective information in the same manner computerized information systems now handle factual and quantitative information. However, the optimal analysis techniques for this type of information are still a very open and researchable question. (Legitech was created by Peter and Trudy Johnson-Lenz, Harry Stevens, and Jim Williams, using Interact, the EIES programming language. See Johnson-Lenz 1969 for more details on this subsystem).

PLANNING AND COORDINATION: WHCLIS AND INTERNATIONAL MEETINGS

The most basic of the features of a computerized conferencing system such as EIES are the unstructured conference and the private message system. One of the most active groups on the system during the last two years was the "World Symposium on Humanity". The Symposium itself was a week-long event held in April 1979...simultaneously in three locations-- London, Toronto and Los Angeles. They eschewed a single headquarters where all decisions would be made by one person or a small group and then dictated to the other locations. EIES made possible, through a joint conference participated in by several people at each of the three locations, a decentralized decision making process and daily sharing of information, problems, and issues. During the first six months, the main conference alone for that group generated about 800 entries. In summarizing the experience of using computerized conferencing as the primary means of communication to coordinate this effort, one of the leaders wrote:

Figure 2: A Testimonial
Use of a Computerized Conferencing System to Coordinate an International Organization

Frank Catanzaro (1978)

Due to the highly innovative and decentralized nature of the World Symposium planning effort, it was felt that access to EIES would provide both a highly synergetic relationship between the Humanity Foundation and other EIES users, and a unique experiment in the effect of computer conferencing on the evolution, management and organization of such a large transnational event....an event dedicated to peace and the future. Presently, at any major Humanity Foundation office you will find, somewhere, usually under a mound of computer paper, a small desk-top acoustic coupler terminal. These devices have a simple keyboard and a roll of paper, and can print out messages at a spunky 30 characters per second. They are lightweight and portable, usually coming in travelling cases...indeed, when Symposium staff travel, they generally take their terminals with them, so they can plug in through the phone system wherever they go. The terminals are used daily by our staff members in Los Angeles, Toronto, Vancouver, Boston, New York and London, to maintain a constant flow of communication between offices. The range of communications which this medium is able to transmit is quite remarkable. In the course of our use of EIES, these have ranged from budget formulation and debate, to the posing of motions and voting upon them, to a key-worded random accessible production notebook, to the sometimes soul-wrenching torment of cutting through the obstacles on the way to the World Symposium on Humanity. The system is used as a confessional, a message relay to others in our major cities, and a scratchpad for articles and letters that find their way into our publications and files. We have even used EIES to link major conferences together...for example, in August we had Symposium staff members attend the Canadian Futures Fair in Ottawa, the Annual Convention of the Association for Humanistic Psychology in Toronto, and the Cable Television Conference in San Diego. Users accessed EIES through telephone booths on each of the three sites, and exchanged reports of the proceedings, with participants in the conferences adding their own personal notes. When one of us sits down at a terminal and dials the local Telenet computer network telephone number to connect to the EIES computer in New Jersey, we have come to expect, regardless of the content of the latest messages, an immediate sense of electronic camaraderie. A sense of the disembodied presence of the group as a whole seems to leap from the printed page with the first few keystrokes. The record of all our conversations, disagreements, fun, poetry and even affection is maintained in a continuum which becomes suffused with the vital spirit of our effort. EIES has become a living element in the ongoing organization of the World Symposium.

A computerized conferencing system allows decentralized control because it provides the ability to coordinate actions and to establish the accountability for actions necessary to support decentralization. One would have to view the transcript of the Humanities Foundations's conference to really comprehend that we have an example of a group of people spread out half way around the world acting as a single project team, sometimes on an hourly basis. We know of no other way that a dispersed project team could have worked together with the same coordination of effort that can usually only be exhibited by a co-located team. Another example of meeting coordination was the White House Conference on Libraries and Information Services. During the six months prior to the large meeting in Washington D.C. in November 1979, approximately 35 members of the national advisory committee and central staff planned and coordinated the conference largely through the use of EIES. At the conference itself, approximately eight terminals were used to input and index the hundreds of resolutions produced by the working groups, according to an indexing sceme developed ahead of time (See Kerr, 1980 for a complete account of this application of EIES). EIES was also used for international coordination of the World Futures Studies Conference in 1979, as well as for remote participation in the Berlin meetings by U.S. members and onlookers. The executive secretary described his organizations use of and projections for computerized conferencing as follows (Menke-Gluckert, 1979, p.3.):

> The Program Committee of WFSF tried to organize the Berlin gathering as a self organizing exercise or part of an ongoing learning process. To underline the concept of self structuring and self generating open conference style, the Berlin Conference has started already three weeks ago as part of a world-wide computer conferencing exercise, which will accompany this conference during the next three days. Every participant can exchange his thoughts on all conference items with more than 600 other computer conference participants all over the world. In five years time, Computer Conferencing will be a normal communication medium used everywhere, linking most easily and practically problem generators and problem finders to experts within and outside the scientific community. Information exchange and planning decisions are made reliable through computer-assisted conferencing.

CONSENSUS FORMULATION & PROBLEM SOLVING: JEDEC

One of the preliminary tasks in many negotiations is agreeing on the precise meaning of the terms which will be used. This may be especially time consuming in multi-lingual, multi national negotiations, where comparable translations must be agreed upon, to make sure everyone is talking about the same thing when a word or phrase is used.

A prototype for a system which can be used in the preliminary stages of negotiations has been designed for the EIES system by Peter and Trudy Johnson-Lenz. It is being used by the Joint Electronic Devices Engineering Council, which engages in the difficult mission of getting competing companies to agree on industry-wide standards for products. As they explain the TERMS software in the on-line documentation which they created (Johnson-Lenz, 1975):

> +TERMS has been designed to increase the ease and efficiency by which glossaries of terms and definitions may be developed by a geographically dispersed group of people working together over EIES. This special software has the following features of particular interest:
>
> o any glossary member may add a term or an alternative proposed definition for a term.
>
> o any glossary member may enter a written comment about a proposed definition.
>
> o participants may vote on the alternative definitions; immediate feedback of tabulations of their preferences is available using a single command.
>
> o all information related to a specific term may be retrieved, including all definitions, comments, and results of voting, using brief, concise commands.

The process of continuously building and documenting a consensus introduces a new dimension to all sorts of groups that have to continually reach or negotiate agreements. It means that the process can be stabilized and made insensitive to changes in the individuals participating in the process.

Some of the associated properties we seem to be observing with respect to human problem solving in this medium are the consideration of larger numbers of options or alternatives and fewer psychological pressures towards forcing a concensus within a short period of time.

In other cases, such functions as contract negotiation and the designing of contracts have been accomplished using computerized conferencing systems. In all cases there seems to be agreement that the process is much faster than other alternatives when the individuals are not co-located.

INTERNATIONAL POTENTIALS

We believe that computerized conferencing can increase the quantity and effectiveness of international cooperative efforts to prevent the escalation of conflicts and crises to the point where war occurs. Among the kinds of functions which can be performed for international organizations or networks of individuals and groups are the exchange of information which promotes and builds peaceful cooperation; monitoring and detection of incidents or threats to international relations; negotiation of agreements; resolution of conflicts; and crisis management. In this section we will move beyond current data and applications to suggest developments and applications of these types which might occur in the next decade.

Among those who have seen the international potentials of computerized conferencing is Anthony Judge, who argues that "computer conferencing could really constitute the much needed breakthrough in international and transnational action.... In a special sense computer conferencing gives form and structure (however subtle and dynamic) for the first time, to the Sixth Continent-- The transnational non-territorial world-- over which so much activity takes place" (Judge, 1979, P. 402).

INFORMATION EXCHANGE

The concept of using a computerized conferencing system for information exchange on an internatinal basis opens the door to a host of decision aids that could greatly facilitate the process by overcoming both language and cultural differences. The first example of this would be a system for aiding in the use of on-line translators to support the information exchange process. Transcripts of the discussions could be kept in as many languages as needed. When a person writes an item, he or she would designate it as ready for translation, and the computer would find the next available translator qualified to do the translation. The writer could designate various options such as reviewing the translation if they can read in the language or having it re-translated from the translation back to the original language by another translator. Given enough translators in relation to the people engaged in the information exchange process, the dialogue could move quite rapidly.

The next concept is to introduce an extended version of the +TERMS system. This would allow the group involved to build up over time a data base of accepted translations for various words and phrases that are specialized to the technical area they may be dealing with. Such a data base could be incorporated into the system given to the translators to get rough draft translations done. In the long run, this means the group would capture the 'lore' that governs their discussion and the process would become less sensitive to changes in who is actually participating. In other words, there would be less repetition of mistakes that are made by new individuals because of the language barriers and cultural differences.

The next phase of development is the incorporation of other types of decision and analysis aids that would facilitate the pinpointing of disagreements. The simplest of these are voting and estimation processes that already exist on EIES. Using such aids a group can see from the desirability or feasibility of an alternative or the distribution of cost estimates for carrying out the option as provided by the members of the group. This concept extends further to the incorporation of analytical models that can check consistency of viewpoints among a large set of data items.

Probably of greatest potential significance in this area of aids is the extension to inference type systems such as are now used in the medical diagnostic area. In this process individuals in a group can contribute English like statements representing premises about a given topic and the computer can pinpoint inconsistencies in the premises as they arise from different members of the group as well as making predictions about possible new premises. Early unclassified work of this sort in the international area is represented by North et. al (1963).

MONITORING AND DETECTION

One of the more recent public examples of shortcomings in international affairs is the African drought and resulting famine. It has been hypothesized that the national leadership in many of the affected countries were reluctant to admit, in the early stages, the seriousness of their problem because of an impression that it might be considered a local problem reflecting on their leadership. As a result, it took far longer than it should have to realize the extent of the developing situation. We would hypothesize that in a more open computerized conferencing environment with the proper analysis aids to correlate factual information contained in various conferences, it is very likely that situations such as the above would have been highlighted and more fully understood very early in the process.

Monitoring and detection is very often a function of imposing human interpretation by 'experts' on the collection of basic facts and data. Many situations require a broad range of experts unlikely to be located in any one place at any one time. Good examples of this are to be found in the environmental, pollution and energy areas. There are a multitude of regional and international bodies concerned with such problems within such contexts as a single river to the sea shared by a number of countries. One would expect computerized conferencing to greatly increase the operational efficiency of such organizations and allow a wider tapping of expert knowledge.

In many situations having to do with economic, political and technical change, the rate of change today seems faster than the ability to detect, plan and react in any anticipatory mode. It would have been interesting to see how a multi-national network of data gatherers and experts would have evaluated in real time the revolution occurring in Iran. Current communications and organizational structures impose a situation where information and analysis from small groups or individual experts are passed up a hierarchy with significant filtering at each stage. Lateral international networks usually only exist at the higher leadership levels and can suffer from the pre-elimination of minority views and data that supports such views as well as the natural bias of humans to emphasize positive aspects of any situation.

Another unique feature of computerized conferencing is the ability to hold anonymous discussions or utilize pen-names. This means that the views undergoing open discussion on an international net do not have to be perceived as an official position. It is a well known phenomenon that the view of an individual may be considerably influenced by who uttered something as opposed to what the utterance was. This could be quite significant in a negotiation situation or in evaluating an action. However, in the analysis and synthesis phases associated with any monitoring and detection operation, this could be a very dangerous bias. It could very well be that monitoring and detection networks could operate more effectively if anonymity were imposed upon the members of the network. In any case, the issue is a researchable one.

NEGOTIATION

It is doubtful that computerized conferencing or any form of teleconferencing is going to make inroads into the standard face to face negotiation process for some time. Those engaged as negotiators, whether on a commercial or political basis, have developed a rather fine art that has its own rules and protocols. However, any negotiator is backed up, in most instances, by a rather large team of support individuals who must review and assess alternatives brought up in the negotiation process and provide information. In addition, decision makers who must approve or endorse changes are often remote from the negotiation scene. Because of this, the first area of potential utility for this technology is the speed up of information exchange and analysis among the individuals involved on one side of the negotiation process.

The second likely phase for use of this medium is agenda setting prior to face to face meetings. Reports from EIES groups which have used the medium for this purpose indicate that this can greatly speed up the progress made in face to face meetings. However, there is a problem in projecting this application to international negotiations. Some analysts have indicated that the Russians, in their opinion, use the agenda setting phase as part of the crucial assessment of the intentions of the other side. Negotiation over the separate points of the agenda signals to the other side how the opponent may react during the actual negotiations. Softness during the agenda setting process may be interpreted by them as weakness. On the other hand, Middle Easterners often want to meet without ever setting an agenda or coming to the point, because they simply are not yet ready to resolve the situation. To insist on setting an agenda ahead of time and sticking to it rigidly will be likely to alienate them. (Hall, 1959) Thus, as in other areas, there is need for field trials which explore how outcomes observed within a single cultural tradition may alter when an international application is attempted.

CONFLICT RESOLUTION

The concept of Conflict Resolution still remains an exercise for academics. While promising work has taken place in this area, there currently seems to be some unwillingness by those in leadership roles to utilize either the conflict resolution processes that have been developed or the modeling aids that have been investigated. At the very minimum, a meaningful conflict resolution process forces people to make the implicit explicit. Apparent "facts" are re-examined to determine the range of belief among the participants; underlying assumptions must be exposed and perceptions of strengths and weakenesses of self as well as other parties must be put on a comparative basis. It is not clear that

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people holding power are willing to subject themselves to this form of "encounter". The process of conflict involves high states of emotion and/or commitment to opposing views. Most attempts to deal with such situations involve the structuring of communication protocols and process models to eliminate confusions and biases that result from the psychological factors involved. Furthermore, the face to face environment seems the least desirable of communication media to promote such processes in an effective manner.

However, the technology of computerized conferencing provides a much "cooler" atmosphere in which individuals can engage in communication on an entirely "self activating" basis. The cooler medium with less social presence tends to promote a reflective atmosphere that is desirable for attempts at conflict resolution.

An example of the type of conflict resolution work that lends itself to the computerized conferencing environment is that by Levi & Benjamin (1977, 409-410). They have developed a process model for the resolution of conflicts which they have tested in situations such as workshops including Arabs and Israelis trying to resolve conflicts in their national goals. Step one in their process is to clearly identify alternative solutions to the conflict; then to have each of the participants rate each solution on a -10 to +10 scale. Besides measuring the degree of conflict, these initial ratings provide a point of reference against which the participants can measure progress as the negotiations continue, and new solutions are proposed and voted on. The method uses a fairly structured approach to regulating the conflict and its negotiation. Based on their preliminary experiments, they conclude that the "approach can be a useful addition to the tools of international conflict resolution" (ibid, p. 422).

However, there are difficulties for the outside consultant/facilitator of such a model of conflict resolution. "Those using the model may not be able to use it consistently, either because of lack of skill or temporary factors such as fatigue. Secondly, the need to concentrate on the model can lead to missing other important developments which require attention and intervention (Benjamin and Levi, 1978). These developments have to do with interpersonal relationships between the participants, as opposed to the task of solving the underlying conflict between them (Levi, 1978, pp 2-4). Levi proposes that a computerized conferencing system be used to implement the model. "Computerizing the model should solve these difficulties. By taking over the human intervenor, the computer can assure reliable application of the model, regardless of the skill or mental state of the consultant or participants. More attention can then be paid to interpersonal issues as they arise. The computer can even be programmed to remind the participants of such issues" (ibid, p. 4).

We believe, with Levi, that significant efforts are needed to integrate the efforts in conflict resolution with modern information and communication technology. Given that basis of development, the next and more crucial step is to get individuals in leadership positions willing to undergo these structured exercises. However, there is another possibility that may be an easier objective and have the same sort of long term impact. Given that modern computer based systems for conflict resolution are readily available it becomes possible to consider such conflict resolution systems as a new form of survey and polling. Provided large enough samples of the populations concerned with the issues can be put through these electronic workshops the resulting outcomes can potentially have the same influence on the involved leaderships that polls and surveys can have today. Because of the highly limited and simplistic nature of polls and surveys their application to conflictual issues are often more confounding than useful in terms of the influence they can have on decision processes and decision makers.

CRISIS MANAGEMENT

In the keynote speech to the 1978 ICCC, H.P. Gausmann pointed out that computers and communication technology are:

> "The basis for new information infrastructures which will permit the transition from the present, essentially STATIC, information (such as represented in books, journals, printed matter) to DYNAMIC information in electronic form... selective, up-to-date, precise, relevant information... which is increasingly needed to master the intricacies of the modern world and the rapid changes with which we are confronted today." (Gausman, 1978)

In no application are these requirements more essential than crisis management. As Kupperman and Goldman pointed out in 1974: "We are living in an era of permanent crisis. Science and technology have accelerated the march of history while progress in astute and calculated political decision has not grown apace." (p. 71) Worldwide inflation, extensive famine, international terrorism, massive displacement of refugees as in

Southeast Asia and worldwide resource shortages are all examples of international crises, current or potential, as well as the constant threat of a nuclear confrontation. Crises have in common such factors as a paucity of shared, accurate information, communications difficulties, uncertainty, and an urgency brought on by the sense that if nothing is decided, things will get much worse. Information is the key element in successful crisis management. If it is limited and inaccurate, crisis managers will spend most of their time just trying to find out what is happening, let alone being able to control the sequence of events. Who is to become involved, what irrational acts could occur, who will have to make a decision, who has the information needed at the moment, what previous "lore" applies--are all major questions and uncertainties facing those involved in dealing with the situation. The lack of critical information or, even worse, the use of misinformation are the fundamental sins of the crisis situation: "Insufficient or misconstrued information not only tends to aggravate crises but may also tend to provoke them". (ibid., p. 74)

As a matter of record, one of the first computerized conferencing systems, EMISARI, was designed for domestic crisis management in the Office of Emergency Preparedness (Executive Office of the President of the U.S.) (See Hiltz and Turoff, 1978 for a review of the evolution of this system; McKendree, 1977 for details about the components of this and subsequent systems).

Those involved in EMISARI realized that one of the most crucial aspects of computerized conferencing applicable to crisis management is that it can incorporate access to any existing computerized data base and the use of models. As Kupperman, Wilcox, and Smith put it in the article in Science in 1975:

> "The embedding of a dynamic model in the conference could assist the participants materially in understanding the real import of each other's statements... Because of the power and speed of the computer, a participant could illustrate his proposals for change by demonstrating those changes in the model dynamically and producing results which all could witness identically. Similarly, 'what if' questions could be explored with the model by individuals or the group, without problems of their misunderstanding either the options tried or the effects obtained."

A crisis management system embedded within a computerized conferencing system can provide exactly the kind of dynamic, selectively retrievable information and discussion space needed to effectively manage a crisis. Crisis situations usually impose deadlines whereby actions and decisions must be made and, furthermore, make clear to all that inaction is actually decision as well. Perhaps at the crux of the crisis management process is the lack of a clear cut decision process predefined by those forced to respond. The degree of decision responsibility and the degree of decentralization in the decision process must be established, very often "on the fly" among the parties involved, and as a result represent a consensus process among the parties representing otherwise autonomous bodies. Computerized Conferencing technology is one of the few pragmatic ways in which the decision process can be adjusted by the participants in response to the minute by minute developments and at the same time allow opportunities for inputs that might impact on a decentralized decision.

A system for crisis management would incorporate many of the other functional areas we have been discussing. For any regular international crisis management system to exist we must have a cadre of international crisis managers who utilize the underlying processes and technology for information exchange and monitoring and detection on a regular basis. There is not the time, once the crisis has started, to train the team in the technology and its use.

THE FLY IN THE OINTMENT

While one can paint a very rosy picture of the potential international applications of this technology, there are ever present political and regulatory problems associated with the gray area of the merger of computers and communications. We already have some indicators that are symptomatic of the problems yet to be faced. One problem is that prices for international packet switching networks are set artificially high by foreign governments to protect their TELEX operations. European charges are in the $40 - $80 per hour range for instance.

Currently (at this writing), if a person in England seeks a Telenet account from the English PTT and indicates that he is planning to use a message or conference system, he will be denied an account. Whereas, if he or she indicates plans to use a data base system, the account is granted. It is as if the telephone company in the U.S. asked who you wished to talk to on the phone before determining if you have a right to have a phone.

It seems a "fait accompli" that most

European PTT's assume that they will be the only one offering computerized conferencing or message system technology. Also, it seems that most current thinking suggests that the 'system' to be offered will appear the same to everyone, so that the advantage of the computer being able to tailor communication structures to the needs of individual groups and applications will be unrealized. Basically, the monopoly maintained by the PTT's will prevent the emergence of the entrepreneurs willing to tailor small systems to select groups (such as duplicate bridge fanatics).

We have on EIES a multi-government sponsored research laboratory in Europe, with research associates in many different European countries. It was determined that it would be a cost saving to them to install an EIES system for less than $200,000 to tie these people into an ongoing network. However, it was also observed that it might take them ten years to ever get approval independently from each of the European governments to do this. Hence they have "netted" some of their key people by using our system in New Jersey, though they are all based in Europe.

Recently, a Swedish government agency applied for a license to operate a computer conferencing system they had developed. The Swedish privacy board came back with assorted regulations that included: 1) If a private message between two parties referred to a third individual, then the third party must be notified of the contents of the message; 2) Messages and comments could not talk about religion and politics. If these regulations were to be enforced, the operators of the system would have to read all private material. The issues, we believe, are still in some state of arbitration.

Without a doubt, the rates charged by European PTT's for telenet services and the rates planned for their own TELETEXT type services are protectionist in nature towards TWX and associated services, and do not show any flow through to the customer of the efficiencies of current technology. It is doubtful, in the long run, that these policies will hold back the "tide" of this technology. It is still possible for organizations that are large enough to put in their own private networks offering their own tailored services. Over the long term, new organizations will form to supply the users left out. The penalties will be a longer time lag in many countries and fewer potential benefits realized by the less affluent segments of the social structures in these countries. Perhaps the underdeveloped countries will suffer lost opportunities the most, since they are more inclined to follow the European directions these days than the U.S. efforts.

The existing regulations reflect fears of foreign dominance through "teleinformatics". Walsh (1978) summarized the situation with particular reference to France:

> Europeans share a conviction that information technology is profoundly changing the workings of industrial society and are convinced that a given country will have little chance to control its own destiny unless it develops a measure of self-sufficiency in the new technology. Evidence of the European view is found in rather pure form in a recent report to French President Valery Giscard d'Estaing on the impact of data processing on French society and on possible ways to develop and control it.
>
> The report puts the problem in the context of the long-term societal crisis caused by industrialization and urbanization. France is portrayed as facing a series of challenges which could deprive the country of the ability to determine its destiny. The "computerization of society" is identified as a key issue which could either worsen or help to solve the crisis. The stakes riding on information technology are described as nothing less than the country's "economic balance, the 'social consensus' and national independence." The report goes on to say that "changes in economic and social structures can only be brought about if France can escape from the pressures of foreign governments or groups whose objectives may stand in the way of her own ambitions.

INCLUSION OF THE DEVELOPING NATIONS

Thus far, new communication-information technologies have not served to close the gap between the industrialized and the developed nations. As one prominent spokesperson for the "Third World" put it, the information and communications system is characterized by the same imbalances that affect other aspects of the international system.

> The present structures and patterns of the telecommunications networks between developing countries are based solely on criteria of profitability and volume of traffic, and so constitute a serious handicap to the development of information

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> and communication. This handicap affects both the infrastructure and the tariff system.
>
> With regard to the infrastructure, in addition to the absence of direct links between developing countries, a concentration of communications networks is to be observed in the developed countries. The planning of the infrastructure devised by the former colonial powers precludes, for certain developing countries, all possibility of transmitting information beyond their frontiers (earth stations allowing only reception of television programs produced in the industrialized countries, with no possibility of broadcasting towards these countries).
>
> With regard to tariffs the situation is even more striking and in certain respects quite irrational. Designed so as to disadvantage small outputs, the present tariff system perpetuates the stranglehold of the rich countries on the information flow. It is strange, to say the least, that, over the same distance, communications should cost more between two points within developing countries than between two other situated in developed countries. (Masmoudi, 1979, p. 177)

We believe that computerized conferencing can be used as a tool to redress the balance, rather than perpetuate and increase it. Though this view has yet to be publicly embraced by the developing nations, it does find support among others familiar with the technology, as for instance in the following statement by futurist Robert Theobald, sent to the participants in the World Futures conference in Berlin via EIES:

> I suppose the most dramatic result of EIES for those who have not used it before is that the person living in a rural area of the state of Arizona is able to do as well in communication terms as anyone living in a large city. I was born in Madras, India and I see EIES as being compatible with the communications traditions of this part of the world far more than it is with those of the rich countries. This is not an accepted view among many of my colleagues on this system and we continue to argue about it in various places on this system.
>
> I believe that EIES is part of what I call the shift to the communications era. I am convinced that this shift will be as profound as that which took place when the countries now rich moved from the agricultural to the industrial era. I am also convinced that it is possible for the countries new poor to skip the industrial era and benefit from the increases in understanding and knowledge to avoid many of the costs of the industrialization process. (Theobald, 1979)

CONCLUSION: KNOWLEDGE & WISDOM

The definition on "information" by Becker which was quoted at the beginning of this paper distinguishes it from "knowledge" and "wisdom".

KNOWLEDGE derives from the process of understanding and analyzing information, so that it can lead to intelligent decisions or actions.

WISDOM, finally, is the ability to successfully utilize knowledge to carry out a decision.

It is our belief that the combination communication-information systems which we call "computerized conferencing" can be used by multi-national organizations or groups to create and share more information on a more timely basis for dealing with priority or crisis issues, and more easily make knowledgeable decisions, using the computer as a tool. Or, to put it another way, experimentation with and application of computer based communication-information systems for international problems may help us to move from poorly utilized information to knowledge and wisdom in the conduct of international affairs.

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Title: One Critical Factor: Information, Both Factual and Speculative)

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COMPUTER CONFERENCING:
THE LEGITECH EXPERIENCE

Valarie C. Lamont, Ph.D.
Portland, Maine

In the fall of 1978, a core of state legislative researchers began using a computer-based communications system to exchange scientific and technical information. These researchers were participating in the Legitech Project whose purpose was to design and test methods of exchanging information in the legislative environment. The technology being used was the Electronic Information Exchange System (EIES), housed at the New Jersey Institute of Technology in Newark, New Jersey. The Legitech Project was one of several operational trials of electronic information exchange supported by the National Science Foundation.

Background

The science and technology legislative research environment seemed a particularly appropriate one to test an electronic information exchange system. All state legislatures have at least one research unit which serves both houses; many have a separate unit for each chamber. These research staffs have been building a strong science and technology capability in order to respond in a timely and informed way to legislation in these areas. Alternatively, several states have moved in the direction of establishing a separate, formal science and technology (S and T) unit to better serve one or both houses on the appropriate issues.

In order to better address scientific and technological issues, the research units have been recruiting people with the appropriate backgrounds in biology, engineering, chemistry, environmental studies, and health. Whether in a traditional research office or a more formal science and technology unit, however, one person or a small group cannot adequately address the entire range of legislative issues which fall in the S and T domain. Instead people have developed resource networks to obtain the desired information. However, as the following paragraphs depict, using traditional communications technologies to activate networks does not always produce the desired result.

The routine of a legislative researcher is spent locating information and translating that information into memos to legislators, committee reports, long-term studies and bills. Typically a researcher will activate his/her personal network of local contacts as well as conduct library research. A significant portion of their time, however, is spent calling researchers in other states, legislative clearinghouses and federal agencies. Frequently, the telephone system is complemented by the use of the mails to request information.

While the telephone and mail systems are effective communications systems, they also are accompanied by a host of problems. The number of telephone calls is often constrained by one's contacts in other states as well as by limited telephone budgets. Also, it is not always possible to reach a contact, particularly in the federal agencies. Frequently a link cannot be established because the resource person is out of the office, at a meeting or travelling. Finally, researchers find it frustrating to call five or ten different states with the same question. Clearly, the researchers were interested in a communications system which would enhance their traditional methods of interacting with each other and with resource organizations.

While the emphasis in this project has been the legislative researcher, a new category of participants was added to the Legitech Project. These were people representing the resource organizations such as the New England Innovation Group, the National Technical Information System, the National Bureau of Standards, the Environmental Protection Agency, the American Society of Mechanical Engineers and others. Generally, these groups had a public service mandate and found Legitech useful to keep updated on state information needs and to fulfill information requests.

EIES

From the researchers' perspective, EIES provided a solid base on which to develop a communications system. A basic software package was already available, allowing the users to dialogue and exchange information. Options are provided on EIES in the form of menus which go from the general to the specific. The initial EIES menu allows a variety of interaction modes:

Access to:

Messages	(1)
Conferences	(2)
Notebooks	(3)
Bulletins	(4)
Directory	(5)
Explanations	(6)
Reviews	(7)
Composition	(8)
Monitoring	(9)

The Legitech members used the messaging and conferencing options more frequently than the remaining options. Messages (1) allowed users to interact privately with one or a few persons. This option is used much like the mail system; senders and receivers are the only persons who are privileged to access the messages. Unlike the mail, however, messages are stored in the computer and are easily retrievable through a search routine.

Conferences (2) is a more structured and open option. Conferences are established on any topic which is designated. Each conference has a moderator who initiates, encourages and monitors participation. People can participate only if they are members of that conference. The moderator generally controls entry into and out of conferences.

Conferencing allows users to participate in a discussion asynchronously. That is, users do not have to be on-line at the same time. Thus, they can conference on a topic over a period of several weeks or months. This feature is a particularly useful one to the researchers; it eliminates the problems of setting a particular hour for a discussion as well as the problems of different time zones.

As a final point, items are entered and received in the conference sequentially. The author, date of entry and topic are also identified. This type of structure is very useful to researchers. It eliminates the necessity of trying to relate items to each other and of guessing about the author. An example of a conference item follows:

C710 CC43 DAVE KINNEAR/J. MALINKA
(MNLEG, 710) 9/12/79 3:06 PM L:10
(ORIG.) 9/12/79 3:02 PM L:9
KEYS:/IDENTIFICATION OF DISPOSAL SITES/
A:39

I just read the BOSTON GLOBE article that PSI entered as c39 and noticed that Massachusetts seems to have the same kind of problem with identifying illegal or very old hazardous waste dumping sites as Minnesota does (see comment 37). The Massachusetts plan sounds like a good step toward identifying these sites. I, too, would like a copy of the Massachusetts plan.

Does anyone have any ideas for other ways of identifying unknown clandestine or abandoned hazardous waste disposal sites?

The researchers utilized the conference option in a number of ways. In the early stages of the project, a conference was established to set forth policy for the Legitech experiment. Only legislative researchers took part in the discussions. Prime topics for debate included how resource organizations would be allowed to participate in Legitech and features of new software package being developed for the researchers.

In time, the resource organizations established their own conference. This was a result of a need on the part of the resource people to discuss the skills and expertise they brought to the project and how to bring their expertise to bear on the needs of the legislative researchers.

Another type of conference emerged in time. Several states were dealing in various ways with the topic of hazardous wastes. Through messaging and another conference the researchers determined that an extensive discussion of the topic was needed. With the researchers from Minnesota moderating, a conference was established on hazardous wastes. Membership was limited to those states with an express interest in the topic and a willingness to participate in an exchange of ideas. The purpose of the conference is best expressed in the following conference item:

C710 CC1 DAVE KINNEAR/J. MALINKA (MNLEG.
710) 3/14/79 1:54 PM L:57
KEYS:/WELCOME - AGENDA/

NEW CONFERENCE ON HAZARDOUS WASTE

We are now into the process of trying to set up conference 710 to deal with issues relating to hazardous waste. We have agreed (with just a bit of trepidation) to moderate the conference and are currently looking for a few more participants and some more good ideas for discussion items. LEN, NHLEG and NEIG have expressed interest here in joining the spinoff conference and OKLEG indicated at the NCSL con-

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ference in San Francisco that he also wanted to be a part of this. These four will be part of the core membership when the conference gets underway (hopefully, within the next couple of weeks). We are still looking for more participants. Anyone with an interest can either indicate it here or message me.

TOPICS

The following are some questions that we think should be addressed in conference 710:

1) What are the consequences (environmental, economic, institutional) of having states cooperate and share in the responsibilities (incineration, neutralization, waste exchange, land disposal, etc.) of hazardous waste management, as opposed to having each state be independently responsible for its own treatment and management? Are there precedents? What are the constraints?

2) What is the role of the states in relation to federal mandate (eg. Toxic Substances Control Act, Food and Drug Administration, OSHA) in....

LEGITECH

As mentioned in a previous section, the daily work schedules of researchers require considerable interaction with other states and with federal agencies. This interaction is in the form of posing questions and requesting responses. The messaging and conferencing options in EIES provided the means with which to contact their peer group and resource networks and to have a prolonged discussion on a topic. However, these options did not meet researchers needs for a structured way to pose questions and elicit responses and to share this information with others.

The organization and management of the EIES system is such that users can easily adapt existing software or create new software which is responsive to their specific needs. For the legislative researchers a decision was made to create a new software package, Legitech, for inquiry and response exchange. The software exists parallel to the EIES. The Legitech menus are in the same format as those in EIES, going from the general to the specific. Users can easily go from one system to the other with only a few seconds delay.

Legitech has several features which not only facilitate the inquiry and response type of exchange but also allows users to control the amount and type of information received. These features are described in the following paragraphs, taking a legislative research through a typical cycle on the system.

Upon signing on to Legitech, the user is told the number of topics and responses to date in the system and then asked:

REVIEW HOW MANY ITEMS WAITING? (Y/N/A)

At this point, the user can respond in one of three ways. The Y (Yes) option will take a few seconds and find the number of Topics and responses which have been entered since the last time on the system. It will then ask if the user wants to ACCEPT these items as discussed later.

The N (No) option allows the user to skip all items and go directly to the first Legitech menu. The A option also skips waiting items but takes the user to the ACCEPT question:

ACCEPT WAITING ITEMS? (Y/N/A)

Again, the user has three options. The Y option delivers all waiting responses to previously selected topics, first, followed by new Topics. For each new Topic, the user is asked:

SELECT ABOVE TOPIC TO RECEIVE RESPONSES? (Y/N)

A Y simply means that any waiting and future responses to the Topic will be delivered to the user. An N means that the user is not interested in the Topic and any responses to it.

Still at the ACCEPT question, the N option will take the user directly to the first menu. The O option has several selections:

DELIVERY OPTION? (B,T,R,N, KEY, TOPIC#)?

The B (Batch) option delivers all new topics and responses without requiring the user to make a decision on selecting each new Topic. T (Topic) delivers all new Topics with the Select question; no responses are given. R (Responses) delivers only new Responses. N takes the user directly to the initial menu. KEY allows the user to receive only Responses to Topics under the keyword specified. Finally TOPIC # delivers only Responses to the specified topic.

The several options provide the researchers with considerable flexability in their interactions with the system. If a researcher has little time and wants to enter a Topic, he/she can go directly to the menu without having to waste minutes to get updated on new items. Alternatively, a researcher may want to be updated on new items but not spend the time having to make a decision on Selecting an item. The software generates a print-out of all new items which can be read at leisure by the researcher, with Select decisions made at a later point in time. Essentially the updating method is responsive to the variances in the daily work schedules and needs of the researcher. The amount and format of information is determined by the researcher.

After receiving new items generated by other users, the researcher proceeds to the first Legitech menu:

```
ACCESS TO:

     Topics/Inquiries               (1)
     Background/Responses           (2)
     Your Selection of Topics       (3)
     Alphabetic Index of Topics     (4)
     Topic Members and Markers      (5)
     Members of This Exchange       (6)
     Groups in This Exchange        (7)
     Monitor Options                (8)
     Other Exchanges                (9)
     EIES                           (0)

LEGITECH EXCHANGE CHOICE?1
```

The second level menu, for Choice 1, would provide additional, more detailed options:

```
TOPIC CHOICE?;

DO YOU WISH TO:

     Get Topics with Responses      (1)
     Get Topic/Inquiries only       (2)
     Compose/Add a New Topic        (4)
     Modify/Delete/Close Topic      (5)
     Review Topics                  (6)
```

Through the options on this menu, the researcher can proceed in a number of ways. The most frequently used options are Topics (1) and Responses (2). This is where the researcher is able to compose a three line Topic or respond to another researcher's question. Again, controls are built into the system. The researcher can designate that the Topic go to all Legitech members or to only a few specified individuals. This allows the user to target a Topic to a few states which share that problem or to the under membership to take maximum advantage of all resources. Topics and Responses are presented in the following forms:

```
                         TOPIC

LEGITECH T75 SIGMUND SMITH (PALEG, 711)
2/27/80 10:53 AM
KEYS: /ECONOMICS (CIGARETTE TAXES)/
      HEALTH (CIGARETTE SALES)/
TOPIC: POLICIES FOR CIGARETTES

What is the tax and sales policy
for cigarettes in your state?

3 RESPONSES ENTERED TO DATE AND LISTED
BELOW:


                       RESPONSE

LEGITECH T75R1 CONNIE MAHONEY (WASEN, 735)
2/27/80  2:03 PM
RESPONSE:  WASHINGTON CIGARETTE SALES TAX

SEE REVISED CODE OF WASHINGTON 32.24 &
32.26.  WASHINGTON TAXES CIGARETTES
AT THE RATE OF 16 CENTS PER PACK.
THE FEDERAL GOV'T IMPOSES AN ADDI-
TIONAL TAX OF 3 CENTS PER PACK.  THE
STATE TAX ON CIGARETTES WAS ESTABLISHED
IN 1935 AT 1 CENT PER PACK.  IT HAS
BEEN USED TO PROVIDE COMPENSATION
FOR VETERANS AND FOR RETIREMENT OF
SCHOOL BUILDING BONDS, BUT NEARLY
ALL PROCEEDS NOW GO TO THE STATE
GENERAL FUND.  COLLECTIONS ARE MADE
FROM WHOLESALERS THROUGH THE PURCHASE
OF STAMPS, WHICH ARE AFFIXED TO EACH
INDIVIDUAL PACK.  THE CIGARETTE TAX
PRODUCED $57.8 MILLION DURING FISCAL
1978.  ALTHOUGH ONLY TEN STATES HAVE
HIGHER CIGARETTE CONSUMPTION DUE TO
REVENUE LOSSES RESULTING FROM NON-
TAXABLE PURCHASES IN OTHER STATES
AND ON MILITARY AND INDIAN RESERVA-
TIONS.  SINCE 1959 A SPECIAL TAX HAS
BEEN LEVIED ON OTHER TOBACCO PRODUCTS;
THE CURRENT RATE IS 45% OF WHOLESALE
PRICE.  THIS TAX YIELDED $3.0 MILLION
IN FISCAL 1978.
```

The activity rate has been growing steadily as seen in TABLE I:

TABLE I

SUMMARY OF QUARTERLY LEGITECH ACTIVITY
(JANUARY - DECEMBER, 1979)

	TIME PERIOD			
	QUARTERLY			
Items Authored	First	Second	Third	Fourth
TOPICS	111	93	148	66
RESPONSES	150	191	369	233
LEADS	29	32	52	9

The fluctuations follow the legislative cycle. When legislatures are in session, there tends to be a drop in the number of Topics generated. The researchers are particularly active during this period, responding to "quick turn-around" information requests from both legislators and committees. When Topics are entered during this period, the question is such that the researcher can wait one or two weeks for responses. The fluctuations also reflect delays encountered with new researchers being trained to access the system and other researchers leaving the system or their positions.

The total number of Inquiries, Responses and Leads are important to the researcher; perhaps more important, however, is the number of responses and leads a researcher can expect to his/her inquiry. The following shows how the ratio of Responses and Leads to Inquiries has grown over the past year:

TIME PERIOD	INQUIRY	RESPONSES RECEIVED	LEADS RECEIVED	RATIO
1st Quarter	111	150	29	1.6
2nd Quarter	93	210	31	2.5
3rd Quarter	148	349	34	2.5
4th Quarter	66	155	3	2.8

Certainly, as the software has stabilized and as people have become experienced on the system, the general activity has increased. More important, however, the users are not spending their time only in generating inquiries. They are also making the effort to enter responses. As many have pointed out, an informal reciprocal relationship has been established. Researchers understand that they will receive responses from other states if they themselves are also active in generating responses.

POLITECHS

The Legitech system has generated considerable interest among other groups of people who share common interests and who would like to communicate with each other. A major spin-off of Legitech has been the design and implementation of an umbrella software package called Politechs.

Within Politechs, exchanges can be established on broad topics of interest allowing people who share that interest to interact with each other. The format is the same as that used for Legitech. Users are updated on new Topics and Responses each time they sign on the system. They can then participate in a discussion by entering new Topics or composing responses.

Legitech has now become one exchange in Politechs. Another exchange is Publictech which is a very broad and open exchange. Here, people can pose Topics related to any number of interest areas. It is hoped that more specific exchanges will spin-off from this larger one. Groups which are particularly interested in this type of communication range from vocational rehabilitation, to the Federal Laboratory Consortion to federal agencies.

SUMMARY

The legislative researchers have generally maintained a positive attitude toward Legitech. They have noted in particular the timeliness and quality of the Responses they have received to their queries. Many have pointed out that the system has greatly increased their resource network with respect to other legislative researchers and the federal agencies. Most certainly the system has provided the opportunity to develop a more efficient communication system, eliminating duplication of research effort and enhancing the quality of information provided to legislatures.

POLICY-ORIENTED TEAMS IN COMPUTER CONFERENCE

Manfred Kochen
University of Michigan

1. Introduction

Exchanges of information and coordination of activities requiring rapid flow of information and control signals have been accomplished through computerized store-and-forward messages over telephone networks for about a decade (Turoff, 1970;[19] Hall, 1971;[6] Umpleby, 1971;[20] Engelbart, 1970[5]). The idea had been under development already during the sixties (e.g. Bohnert and Kochen, 1965;[3] Bush, 1945[4]). It is now relatively easy for anyone with a terminal to become a participant in a computer conference. The number of computer conferencing systems and the number of computer conferences within each has recently begun to accelerate dramatically, for several reasons. One is decreasing cost of reliable packet-switched data over existing telephone networks. Another is awareness and know-how about computer conferencing and its benefits. Yet another is the availability of terminals by microcomputers usable as such in offices and homes and the existence or pending existence of several commercial services (EIES: M. Turoff at New Jersey Institute of Technology; PLANET: J. Vallee, Institute for the Future; CONFER: R. Parnes, Advertel Co.) to mention but three.

Those of us who have used existing computer conferencing systems -- CONFER and EIES in my case -- have encountered several problems. We regard these as challenges and believe that they will be met very soon, making computer conferencing one of the most important means of group communication. This is likely to provide us with a powerful new tool for more enlightened policy-making. The formulation of policies on a *complex* issue requires the collective brainpower of the best team that can be mobilized for that issue, when a single well-connected and knowledgeable policy-maker with an expert staff and *his* braintrust of consultants might have *sufficed* for a simpler issue. The most important problem or barrier to the use of computer conferencing (or any other technology) to aid in policy-formulation on a complex issue is the recognition and mobilization of an appropriate team.

If the mix of people who participate via computer conference is insufficiently coherent, representative, motivated, large, diverse and organized by new procedural rules, these key participants are likely to drop out or participate very marginally. They are likely to find the density of information too low, the opportunity cost of the time they spend in participation too high, the pace of moving toward closure too slow, the diversions too distractive, the incentives too feeble, etc.

The aim of this paper is to illustrate and clarify this central problem. I will argue that lack of incentives, incompatibility of world views, of values and personality traits are the main barriers to a set of participants acting as an effective team. I will analyze this claim, suggest how the barriers can be overcome in a computer conference and how to test such hypotheses experimentally.

2. Four Cases

To illustrate how lack of incentives and incompatibilities are chief barriers to success in policy-oriented teams, we describe four experiences. Two used computer conferencing and two did not. Two succeeded and two did not. We begin with an ordinary group process that failed, a very common occurrence.

Case 1. I was one of a group of researchers who participated in writing a proposal that led to a grant. The system was developed as a policy-oriented information system to be shared by a county mental health clinic and a university-based mental health service. Its aim, through shared record-keeping and research effort, was to improve utilization and planning of mental health facilities. This included the policies for governing such shared use. Success would have meant that the two institutions would continue to share the use of this information system. This was not the case. No policies emerged that are now in effect. A rather dismal conclusion, corresponding to a belief held by the principal investigator at the outset, was reached: the barriers to an information system for mental health planners are predominantly political; they inhibit the production of adequate-quality inputs as well as imaginative use of the possible outputs.

As in every failure of a group process, the cause is partly in the group and partly in its management. Outstanding management can get almost any group (within limits) to produce results. A truly great mix of people can produce outstanding results (within limits) despite the grossest mismanagement. In this case, the initial group comprised some experienced and creative systems analysts. The PI's wish to have that group act as a team -- in deciding on a system design, research designs, equipment, conceptualizations -- was undermined by his unwillingness to delegate any part of the research (and budget) to any participant (a classic management error). Constant lack of support for ideas generated by the more experienced participants provided enough disincentives and raised opportunity costs to effect their withdrawal, resulting in a much smaller group of inexperienced assistants to the PI who adopted perspectives and values that coincided rather completely with his.

Tightly knit research teams consisting of a senior scientist assisted by compatible junior assistants and technicians have been highly successful. This is less frequently the case for policy-oriented groups, especially when two or more potentially conflicting interests are involved, as was the case here. The managerial style and the team that ultimately emerged (it no longer included members from the county mental health center) was consistent with the conclusion it reached (and started with). The process had elements of a self-fulfilling prophecy and the group built a web that entrapped them by the very barriers they were trying to identify and overcome.

While incompatibilities among team members accounted for some of the causes of failure, the lack of incentive or disincentives -- project- generated barriers -- seemed to be the major cause.

Case 2. This is another group process that failed, this time with the help of a computer conference. Several of us involved in computer conferencing were invited to a session of the International World Future Congress devoted to this technology. We used EIES to prepare for the meeting several weeks in advance. Enthusiasm and expectations were high by all concerned. The conference accumulated well over 100 lengthy items in a few weeks. I found it prohibitive to find enough time to read the huge backlog of items the two times a week I signed on, not to mention breaking into the discussion with worthwhile contributions or sorting out which of several randomly interwoven themes to latch on to. It was fascinating to watch increases in the heat of a debate between a key participant in Brussels (who had invited me and who seemed to many of us in the U.S. the initial organizer) and an enthusiastic participant in Berlin (who was to be our host) about the agenda of the session, whether some of us from the U.S. could stop for a prior conference in Brussels on the way, etc.

None of us realized it prior to the meeting in Berlin, but we were a policy-oriented group. At the meeting we formulated a statement toward a proposal for linking scientists in developing regions with their colleagues in other regions so that they would feel less isolated, enabling them to participate in mainstream science as if they were in the major centers. The proposal (entered on-line over EIES in Berlin) was circulated and improved by contributions from the U.S. and Hawaii before the meeting ended. There was even considerable follow-up activity but it gradually flickered and has not yet resulted in action toward the desired goal. While a success in many ways (also true for Case 1), the group did not actualize what it was probably capable of accomplishing.

This might be attributed to the lack of committed leadership (though that was present to some extent); although computer conferences are supposed to be less dependent on charismatic leadership with strong organizational ability. The existence of this activity could have been known to over 600 participants in EIES, who could have joined the team that finally emerged. It would have been most helpful if key people in potential funding agencies with the potential interest and power to commit resources were active participants. That would have greatly improved the mix of people.

The sets of persons who participated most actively before, during and after the face-to-face meeting were quite different, with an overlap of about a half dozen at most. The values, goals, perspectives of the individuals in any one set were quite diverse. At one time, all the participants were nearly "addicted" to the conferencing activity, despite the relatively low density of information of direct value to them. Conferencing generates incentives of its own -- beyond the toy appeal for the novice -- that may not necessarily contribute to group productivity.

Case 3. This illustrates successful teamwork without computer conferencing. I was asked to formulate a position or policy for research in artificial intelligence at the IBM Research Center in 1960. To assess the state of the art, develop ideas and formulate a strategy, I enlisted the help of two younger colleagues. We started our discussions with an examination of the major claims about the progress and promise of artificial intelligence that were most popular at the time. We concurred in the conclusion that many of the claims and promises were irresponsible and not of uniformly high quality, and began to analyze the ideas, methods, problems and issues. We conceptualized these and structured the area into: 1. storing; 2. searching; and 3. mapping mechanisms of cognition and information processing. We divided work of surveying the literature among us into these three aspects. Each of us taught the other two what he learned and jointly we composed an overall assessment. We then considered plausible criteria on which to base recommendations for IBM to launch activity in this area and checked our assessment of the field and its potential against these.

The resulting report (Kochen, 1960)[7] succeeded in its aim of helping the IBM Research Center make an informed decision about whether or not to build a program in this field. (We advised against it, and that advice was followed. We developed ideas that eventually led to research in complexity theory, representation theory and models for the organization of relational data bases.) The incentives for each of us were to learn about a very interesting aspect of computer science, active involvement and intellectual responsibility for a major decision, recognition within and outside of IBM (our report was used as a text in an advanced psychology seminar at Harvard), and experience that proved to be valuable in our subsequent careers. Though we started with widely differing views, we quickly reached consensus about the essential values and ways of looking at this field, partly because we wanted to reach consensus quickly (and were receptive to one another's ideas) and partly because each of us stressed only the few most important issues and justified his beliefs about these issues sufficiently well to persuade the others.

Case 4. This is a partially successful computer conference related to a proposal for research on information deficits in medical judgments. The proposal did not result in a grant. This was not unexpected. The granting agency wanted a different form of project organization than the one we proposed; they advised us to resubmit a revised version of the proposal to a different program in the agency, and at the time of this writing is still underway. The computer conference was used not only to prepare the proposal but also to work out the first task of the proposed research. That involved having a team, consisting of a physician and a cognitive psychologist, interview a physician-subject just before and just after he sees patients to determine what information he uses and does not use in forming judgments. Ideas for formulating the questions to be used in the interview and for structuring the interview were exchanged and tried over the conference. The results of a pilot interview were reported and stimulated further revisions in the interview design. They also led to more refined hypotheses, methods for testing them and for better exploratory studies.

The participants were an extraordinary group. The two physician participants, despite interest and intent, never got around to keying in their entries. A research assistant did so on their behalf. They tended to rely and depend exclusively on face-to-face or telephone communications. (It suggested to us that until computer conferencing could accommodate voice input and output, such participants required an intermediary, which was less than satisfactory.) Their commitment was also less than what was required for such a project to succeed, with or without computer conferencing. According to their own testimony, it takes an enormous incentive (malpractice suits, deaths) for most physicians to change their patterns of practice; hence, knowing about, revealing, using information that might call for such change is resisted or at least not embraced.

The other participants were key researchers in this field in other parts of the country. A consensus of views and values seemed to emerge among all the participants. The incentive for most of them to participate was their respect for all the others and their interest in exchanging ideas with them on what they all felt was an important and interesting task.

3. Team Formation

Despite the impressive literature on small group research, we know little about the conditions under which a highly effective mix of, say, 20 persons out of a total of 10,000 "subscribers" to something like a computer conferencing system, seek out one another and form themselves into an effective team to work toward resolving a specific issue over six weeks or so. Small group research is the most relevant body of knowledge, and it has a long history. In the first three decades of this century, the study of gangs led to the beginning of social work. There were studies of children by Terman, Allport, Sorokin, etc. Investigation of small groups in industry by Taylor and of togetherness/apartness led to the theoretical formulations of Burgess, Sheffield, Piaget, Newcomb and Murphy. The study of group problem solving, started by Munsterberg as early as 1914, followed a course of its own.

By the middle of this century, the influence of mathematical ideas and methods, especially as applied to communication theory, was evident in Bales', Strodtbeck's and Stephans' analyses of participation content and rates by participants in group discussion. Graph and probability theoretic models based on binary relations among members were fruitful. Another promising start was the formalization of such hypotheses as Homans' about the relations between the amounts of interaction, I, friendliness, F, activity generated by (A) and imposed by the environment on (E) the group members. Thus, Simon (1952)[18] assumed:

$I = f(A,F)$ with $\partial f/\partial A > 0$, $\partial f/\partial F > 0$,
e.g. $f(A,F) = a_1F+a_2A$

$dF/dt = g(I,F)$ with $\partial g/\partial I > 0$, $\partial g/\partial F < 0$,
e.g. $g = b_1(I-b_2F)$

$dA/dt = h(A,F;E)$, with $\partial h/\partial A < 0$, $\partial h/\partial F > 0$,
$\partial h/\partial E > 0$, e.g. $h = c_1(F-kA)+c_2(E-A)$

to deduce that there is at most one stable equilibrium solution. Experimentally it was found that the average conference has dual leaders, an "idea-person" and a "best-liked" person (Bales, 1957).[2] A practical instrument for assessing compatibility was developed (Schutz, 1958).[17] It was based on a three-dimensional view of personality aspects relevant to interpersonal behavior (Inclusion -- I join or like to be invited, include myself or like to be included; Control -- I influence others or like to be influenced, control others or like to be controlled; Affection -- I act friendly or like others to be friendly to me, act close or like people to get close to me). Two or more people were found to be compatible to the extent that they have the same orientation in the affection dimension, i.e. when they agree on the degree of closeness, complement one another in giving and receiving affection, etc. If two people disagree on the desired amount of interdependence -- about how much to participate, conform, and show closeness -- conflicts will surface. Disagreement about who should initiate the selection of others, a plan of what to do, a close relation also leads to conflict and incompatibility.

In the past three decades, the most relevant research included experiments with DELPHI Linstone and Turoff, 1975),[11] a variety of studies of consensus (e.g. Reed, 1979),[16] the use of n-person game theory (Marschak and Radner, 1972),[12] "intervention theory" of group processes (Argyris, 1970)[1] and general 1970)[1] and general theory (Miller, 1975).[13] It is quite possible, however, that entirely new conceptualizations, not even based on existing lines of thought, may be created to meet the need for understanding the processes by which teams form themselves to deal effectively with the complex issues facing us. To the best of my knowledge, the present state of understanding and know-how in group dynamics does not meet this need; nor is there evidence that progress in that direction is likely.

The first consideration in modelling team dynamics is to specify performance variables. For a policy-oriented team, this should be an assessment of progress toward a satisfactory policy on an issue that requires teamwork. Such an assessment is likely to require several variables, such as:

R: the extent to which a situation is seen as presenting an issue, after it has become one that requires management if it is not to develop into a situation inconsistent with the community's values and before it has progressed so far that intervention can no longer help.

S: the quality of ideas for appropriate and timely management.

A high rating on R requires that the team grasp the dynamics of the situation as a whole. It is unlikely that any single team-member could grasp in its entirety a complex task-situation such as inflation, decline in productivity rate, a medical emergency in a remote region, docking two spacecraft, a natural or manmade disaster, etc. Each person has a partial picture, as if he were one of the proverbial blind men feeling part of an elephant. For them to function as a team, they must share a minimal conceptual repertoire. The image of an elephant must be common to the minds of the blind men, or those that have it must be able to impart it to those who do not. More importantly, the potential teammates must each give a small number of shared concepts top priority during the critical moments of team-formation, which is concurrent with "situation-grasping." The blind men would not all be touching parts of the same elephant if they did not simultaneously share a common interest in identifying that animal just then. Somehow, the situation may "reveal itself" just as the potential team with its potential for grasping the situation dynamics "unfolds," i.e. may be actualized. The elephant, through the information it provides to the blind men via tactile modalities, and through the resulting synthesis of that information with what they already know and through communication "reveals" itself to the team, and its potential to "see" an elephant is realized.

A high rating on R also requires that the team members share the values by which they judge situations to be acceptable. In addition, they must all have sufficient incentive to continue to participate in teamwork. Thus, the blind men must all consider it valuable to them to discover the elephant and consider the benefits to exceed the costs to them to continue their joint inquiry until they succeed. In Marschak's[12] formulation, each member has a total preference ordering on the "states of the world" in which the state of "seeing the elephant is preferred to all others, and this is the group preference ordering as well. In Schutz's[17] terms, the team members should all have similar feelings about the most desirable degree of closeness, about who should initiate communication, etc., about the optimal degree of interdependence.

It is highly improbable that among 10,000 people, even selected people, that more than a dozen potential teams with all these properties could exist. (The number of groupings of, say, 10 people out of 10,000 is about 10^{29}, and if one group after another tried, at 1 day per trial, it would take many times the age of the universe to get through a small fraction of the possibilities.) How then could and do appropriate teams ever form? The first group that forms is probably already a fair approximation to the team that finally emerges -- and with surprising speed.

Somehow, an appropriate dozen rise, simultaneously, spontaneously and independently to the situation, perhaps responding to the same cues. Then, they quickly sort themselves out, with a few who are incompatible with the rest replaced by others who fit better.

A good team is, almost by definition, one that rates high on S, provided that the situation in response to which the team emerged is one that required the team to produce ideas for appropriate and timely management. To describe the process by which such ideas are generated, analyzed, realized, discussed, utilized and phased out, we once again need new concepts and methods of observations. The main concept may resemble the one used to explain team formation: the appropriate mix of concepts that comprise a good idea arise simultaneously, spontaneously and independently to the situation, perhaps in response to the same stimuli. Then, the mix rapidly refines itself, with the few that do not fit well replaced by those that fit better.-

4. Toward Teamwork by Computer Conference

Once enough of a conceptualization to formulate testable hypotheses has been produced, experiments to observe the formation of policy-oriented teams can be conducted. A system such as CONFER could announce to a mailing list of persons at various levels of government, industry, academia, think tanks and citizens who have expressed their concern with certain issues of urban or regional development that a computer conference will start at a certain date, and how to join it. The issue might deal with solid waste disposal, traffic control, housing, pollution control, nutrition, health care, etc. It could also be announced in local newspapers. Citizens without terminals or accounts of their own could use a public terminal at the nearest library. The debate might be partially financed by industry and government as long as it is an experiment, and then by the participants themselves (perhaps with government matching funds to subsidize would-be participants who cannot afford it). New procedural rules are to encourage the spontaneous formation of a variety of potential teams.

A number of commercial services of this kind are already underway. PLANET has been used for specific conferences in the service of a particular industrial or governmental client. LEGITECH and POLYTECH are being used successfully for networks of state legislatures. The much larger number of informal networks used by government and industry to perform this function are likely to adopt computer conferencing as soon as the users and financiers are persuaded that this is a more cost-effective way to manage.

While we cannot measure R and S except by asking for the judgment of participants and observers, we can try to observe the light-to-heat ratio and information density during the discussion. Verbal exchanges can be content analyzed for words pertaining to the issue and the ratio of such words to all words used can estimate information density. Using a thesaurus, such as Stone's, certain words indicative of emotion -- e.g. anger, anxiety, impatience, etc. could be screened for. The intensity of such emotions could be monitored by providing participants with a means for expressing them more directly. Discovery of relevant ideas can stimulate heated feelings of a positive nature as readily as frustration or incompatibility can stimulate heated negative feelings. The former are likely to reinforce further participation positively and the latter negatively. Low information density is likely to evoke negative feelings and lower participation. Some mix of light and strong feelings of a positive nature ("good heat") may be optimal, though it may require a certain level of "bad heat" (creative tension) on the way.

We cannot objectively rate S, the quality of ideas toward an effective policy to manage the situation except by hindsight. Perhaps the best we can do is to rate the quality of justifications given for various beliefs and for proposed steps toward a policy. This requires a more sophisticated content analysis of communications than the search for words in a checklist. The fraction of the content in what is communicated that denotes well justified beliefs or suggested steps toward a policy is the light ratio.

A variety of hypotheses can be tested: 1. the light ratio increases with information density; 2. the light-to-bad-heat ratio increases with the compatibility of the team, averaged over all pairs of members; 3. team compositions shift toward a team of greater mean compatibility as the light ratio increases; 4. the rate at which justified ideas are generated increases as team compatibility increases. We have already mentioned the hypothesized relation between participation and density as well as heat-ratios and incentives. Testing of such hypotheses is not a straightforward experimental design problem, because it is difficult to control all the relevant variables as required for rigorous statistical inferences. Empirical studies should therefore be regarded as exploratory rather than confirmatory research. Nonetheless, the designs (selection of topics, rules of procedure) and methods of observation should be much more systematic and carefully planned and implemented than has been the case so far for studies in computer conferencing.

A great deal of additional conceptualization and pilot experimental will, of course, have to be done. The notion of "closeness" for example in Schutz's[17] FIRO test takes on a different operational meaning in a computer conference. It is not a well-defined concept in face-to-face groups. It has a physical aspect, measurable by the distance between them when they converse. It has a psycholinguistic aspect, perhaps measurable by the extent to which each person makes reference to intimately personal concerns of the other(s). It has a visual aspect, measurable perhaps by frequency of eye contact, pupil dilatation, etc., an olfactory component, possibly a tactile and auditory one as well. Only the psycholinguistic aspects might -- with some distortion -- be in effect over a computer conference. But wholly new components of "liking" and "closeness" could perhaps be expressed through the Eugrams (Lederberg, 1980)[10] of computer conferencing than was possible via face-to-face. Expressions of like or dislike that persons would not have communicated, thought of communicating or had opportunities, time or resources to compose could now be possible.

It is easy to see the kind of model that would emerge for team dynamics. It would extend the Simon-Homans[17] model (without assuming linearity, however), combined with relational or network approaches (Pool and Kochen, 1978)[14] and introduce the methods of analyzing dissipative systems to account for the formation of novel teams and the ideas they generate (Prigogine, 1976;[15] Kochen, 1979).[8,9]

If such models are enriched by a cumulative body of empirical findings and developed to a higher level, then we may begin to understand the process of team-formation and function and perhaps by appropriate management of computer conferences. This should contribute to the art of team-formation, which is increasingly inportant for coping with the complex situations we are likely to face.

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PILOTING COMPUTER-BASED MESSAGE SYSTEMS

(ASSEMBLY REQUIRED; BATTERIES NOT INCLUDED)

Murray Johnston
CompuServe, Inc.
Columbus, Ohio

The first phase in implementing a computer-based message system is to fully understand the benefits of such a system. You must then decide which strategic approach is best for you and your organization. There are three basic approaches and your choice will determine everything from the terminals you buy and the level of training required to how the project will be justified and how much corporate visibility you will receive.

The first appoach looks at the project as a "Cost of Doing Business". That is, merely as a replacement of one means of communication for another in which the organization is left unscathed. The objective of this "Cost of Doing Business" approach is simply to reduce tangible direct costs. An example would be to replace a TWX operation with a computer-based system yet keep it in a "message center" environment with operators doing all the keystroking.

The second approach looks at the project as an improved "Method of Doing Business". Here you begin to take advantage of the non-simultaneous nature of computer-based message systems. That is, because messages do not automatically print out at some predetermined location, users can create and retrieve their messages anywhere and at any time they choose. This also reduces many of the communication problems caused by differing time zones. The objective of this "Method of Doing Business" approach is to improve the effectiveness of communications with those individuals who are hard to contact. Note that saving money is not necessarily a primary goal even though there are significant amounts to be had. An example of this approach would be providing the system to field sales and/or engineering forces.

The third approach views the project as an "Investment in Doing Business". With this approach you are implementing the computer-based message system as a tool with which to improve white collar productivity. This necessarily means a greater level of hands-on usage by both professional and managerial personnel. The objective of this "Investment in Doing Business" approach is to build a decision support system. The implications are enormous and it is in this arena that you begin to measure the impact of reducing interruptions, you hear executives say they prefer typing a message to playing "telephone tag" for a day or two trying to get hold of someone, and you even see people opt to take a portable terminal home to clean up some work rather than stay at the office for the evening.

The purpose of the remainder of this article is to present a somewhat "cookbook" methodology for implementing a pilot project. It assumes you have chosen to view your computer-based message system primarily as an "Investment in Doing Business" (approach 3) while applying emphasis to problem applications that address the better "Method of Doing Business" approach.

PLANNING

As mentioned, the first phase in the implementation of a computer-based message system is to understand the conceptual benefits and make a decision on the "approach" you want to take. Then, using your knowledge of the organization, select a group of applications and users to exploit the full range of available benefits. Always keep in mind you will eventually want to measure each application in terms of cost and user acceptance.

The first application you choose should be your own department. This will help prove your belief in the productivity benefits and keep people from saying,"If it's so good, why aren't you using it?" More important than this defensive posture is the fact that by using it you will better understand the system. Also, should the users experience any difficulty you will be able to empathize with their problem and know how solve it in the best manner.

One excellent method for choosing applications is to look at the orientation of the company. If your corporation is marketing oriented choose a region or district. Talk to the Vice President or Director and show him how the system can not only improve the effectiveness of communications but also reduce telephone and/or TWX costs. You could even talk in terms of the competitive edge he could gain.

If financial concerns get precedence choose an application where you can show an improved cash flow. Look at how the system might aid in an order/invoicing operation or better manage inventory levels. Specifically, you may find it

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lucrative to see where people are relying on (and probably frustrated by) the U.S. Mail.

If you are aware of some major projects in the planning stages suggest the use of the computer-based message system as a tool that could reduce the necessary head-count. You may also be able to show a reduction in the time necessary to complete the project. If you are lucky, you may find a project that is being handled by several identical teams. You can then provide the system to some of the teams and measure the project in terms of length, communication costs (i.e. telephone, express mail, etc.), and survey the reaction of the team using the system. Remember, testimonials will help convince those individuals who think typing is strictly for secretaries or proclaim the system is too cold.

Once you have at least targeted some applications you must choose the appropriate system to meet these needs. The following is a list of "Do's and Don'ts" for choosing the best system.

-Do choose a "friendly" system having easy to understand (and remember) commands. For instance, the command for retrieving messages should be RETRIEVE or RECEIVE, not **!?*.

-Do use all hard-copy terminals at first. You can always switch later, but the "Paperless Office" should not be your initial goal.

-Don't provide too much too soon. Electronic filing and calendar systems are not usually necessary for a pilot project. They require additional expense and "upfront" training.

-Do choose a system having an easy to learn and use on-line editor.

-Don't choose a system that forces messages into an "official" memo format...it is these kind of features that make the system seem cold. The system should allow freeform message creation, if the user wants it to look formal he or she can type it in that way.

-Do choose a system that can provide interactive computer assited training. A feature of this nature can drastically reduce costs, especially for training remote users.

-Don't develop the system in house. Remember, your primary objective is to test the feasibility of this new office technology. Your best bet is to choose a service to limit the risk of investment and performance. If you later decide to go corporate wide you should make a cost analysis to determine whether or not to stay with the service or begin development of an internal system.

-Do choose a transaction-priced service. Systems that charge by connect time penalize users who aren't good typists. The system should also provide a good chargeback method in which, like telephone calls, the originator of the message is charged.

-Do choose a system that provides a "forms" feature. This capability allows the system to be used for data collection and standard report applications.

Developing the project proposal (and getting approval) is the final step in the planning stage. The proposal should begin by identifying the overall objectives in both quantitative and qualitative terms. Costs should be projected for the system and required terminal equipment. A good rule-of-thumb is to allow $100.00 per user per month. Thus, a four month project involving 50 users would cost around $20,000. You can do it for less if you can arrange for some of the users to share terminals. If possible you should fund the entire pilot project out of your budget. This will give you greater control and remove one major obstacle in getting a department head to participate. Finally, the implementation plan should be outlined. Set time frames for acquiring terminals, training users, taking checkpoints, collecting information, report presentation, etc. The minimum time you should allow for the project is four(4) months. This gives a couple weeks to get organized, one month for users to get comfortable using the system, two months for mature/measureable usage and finally a few weeks for analysis and report preparation.

PILOTING

The pilot phase of the project begins with user orientation. It is almost always a good idea to explain the reasons why the corporation is embarking on the project. Participants should understand the overall objectives of increased productivity and reduced communications costs. You can then explain how their application fits within this plan and discuss how they are part of an "elite" group chosen to evaluate the system. Many project leaders are prepared to work with people who fear computers, but also expect those who are overly cooperative because they fear not being part of the "Age of Computers". In the initial orientation session you should demonstrate the system. This is not intended as official training but is included just so they see it works. If feasible, validate the users ahead of time and put "welcome" messages in the mail boxes for them to retrieve at this introductory session.

Training can be accomplished in a variety of ways, however, the teaching rule of "the more personalized the better" holds true. Plan how you will train remote users ahead of time so there will not be a large delay before they are brought on board. Consider aternatives such as bringing remote users to regional sessions, a caravan approach, or even simple telephone discussions. Video cassette courses and computer assisted systems may also be beneficial. Tell the users they should use the system for everything possible during the first month to gain familiarity and learn what types of communication are improved by the system. They should also be encouraged to ask questions, preferably via the system.

Support is essential...unchecked confusion will guarantee the project's failure. Set up a standard method for handling questions and problems. The system administrator should be the focal point for this activity so the information can be leveraged to help other users who may experience the same situations. Publish a troubleshooter guide to answer standard ques- like:"I'm getting double characters when I type ...what's wrong?" and "I ran out of paper...how do I get more?" Another good suggestion is to periodically call participants to see if they are experiencing any difficulties. Some users need this kind of prompting because they feel dumb asking questions. Good support consumes a lot of time, but it must be provided. Nothing is more frustrating than the final evaluation turning up problems that could have been easily solved had you known about them.

Collecting usage information is an ongoing process during the pilot phase. The most difficult task is collecting quantitative data. The use of log sheets may be valuable for cost information on what communication alternative would have been used had the computer-based message system not been available. If you have enough lead time you may want to provide eventual users with telephone credit cards so there is more accessible documentation for analyzing cost savings. Try and choose applications that are measureable. Surveys are a good vehicle for information collection. Three surveys, one at the end of each month of usage, should be the maximum number you expect the users to fill in. Don't forget to measure general feelings of acceptance with questions like: "Do you like it?" and "Does it help you perform your job better, faster, easier?" It is powerful to report to management that 80% of all users "liked" the system.

ANALYSIS & REPORTING

The last phase of the pilot project is to analyze the data you have collected and develop a report delineating your findings and recommendations for expansion. The intended audience will determine the structure of the report. You should include an executive cover letter that discusses the productivity issues and estimated direct cost savings. Whenever possible, use graphics in the report to illustrate extrapolated costs and savings. Detailed calculations should appear as appendices. Terminal equipment usually represents a major expenditure whether you decide to purchase or lease. Talk to your financial director to determine the most advantageous method for your corporation.

One of the primary points to cover is the importance of support from top management. This shouldn't be too difficult if your executives share the same concern for increasing white-collar productivity that is aired in FORTUNE, FORBES, and The Wall Street Journal. The main reason some management personnel will resist the system is simply because they are afraid an increase in their budget for terminals could make them look bad. If communications costs do not get charged back to users in your organization, even the direct cost savings represent no incentive to use the system. This may reflect a manager's "micro" point of view...but it is reality. It is these types of situations that can be limited by a policy statement from the executive committee urging participation and cooperation.

In developing cost models, don't forget to include the corporation's cost for a person's time. For instance, industry studies show only 28% of telephone calls are successful. Obtain information from your telephone representative as to what is the overall average length and cost of your company's local and long distance calls. Talk to your personnel people and have them get you a "per minute" cost for management and professional employees. If you determine a long distance call takes $2.65 worth of an employee's time and costs $2.13 in telephone service, factor the "real" cost of a "successful" call by dividing the figure by .28. Extrapolate the potential savings by comparing this cost to the cost of the system when users use the system to send 5 messages per day and there are a total of 500 and 1,000 users validated on the system...you will probably have little trouble getting top management's attention and support.

Your approach for expansion should be similar to setting up the pilot project. Choose applications carefully always making sure you have the proper staffing to support the user population.

MACC'S COMPUTER MAIL SYSTEM--
ITS FEATURES, USAGE STATISTICS AND COSTS

Al Roberts
Manager, User Services
Academic Computing Center
University of Wisconsin-Madison

Brief History

In January 1974 the Academic Computing Center, University of Wisconsin-Madison (MACC) sent a requisition to the National Technical Information Service (NTIS) for the documentation and computer tape for a conference program. The need for the program had arisen because a UW Central Administration Computing Task Force was developing a long range plan for the UW System computing. The use of computer conferencing looked like an excellent method to conduct an on-going conference among the geographically dispersed campuses of the system represented by individuals who were not always available at the same time for telephone conferences or for face-to-face meetings. We received the program and got it working on our Sperry Univac 1108, and began learning about and experimenting with computer conferencing. We decided that computer conferencing had many other potential applications in the University environment with its many committees and meetings.

In order to publicize and promote the system we invited Dr. Murray Turoff, who was heavily involved in the design of the system obtained from NTIS and computer conferencing in general, to give a lecture at the UW.

In spite of our efforts at promoting the system, it wasn't used much. The major users turned out to be those who were already using computer terminals for other things. Our own consulting staff had set up several conferences to assist users with our computing resources, and these conferences were working well.

However, early in 1976 an opportunity arose for MACC to develop a computer mail system for use by the fledgling Edunet organization. Edunet is a network of universities that share computing resources primarily by the use of computer terminals connected to Edunet host computers via a national data communications network such as Telenet. Computer mail, or electronic mail is an important tool for communication among the network members. With the support of Edunet, MACC started its Mail project.

Design Goals

Primarily to respond to the Edunet environment, and also because we saw the need for general enhancements, we developed a design specification for a new computer mail system which would combine the best features of existing mail and conferencing systems. Dave Brown and Dave Reiner on the MACC staff did some of this original evaluation and design work. Here are the main ideas that affected our design.

1. The number of lines for a given message must be expanded considerably from the limitation of nine lines available in conferencing system obtained from NTIS.
2. The computer mail system must emphasize private communication between two individuals or an individual and a group, rather than public messages for all participants as in a conference.

3. We wanted to emphasize simplicity and minimal learning on the part of users. The Hermes computer mail system which we evaluated at the time required people to learn about features they didn't need for simple use.

4. A modular design for the program would allow charges for only those commands used.

5. Mail would use a magnetic disk file on MACC's computer on which all the messages would be stored. Each message would be uniquely associated with a specific sender and receiver, or group of receivers. Senders and receivers would be able to perform operations on the messages with the commands described in more detail below.

   Although complete message privacy would be maintained it was felt that a MACC staff member, or "postmaster" should have the capability of accessing the message file for troubleshooting, performance evaluation, and the need to perform other operations on the file, such as cleaning out "dead letters."

6. An important design goal was the ability to link the MAIL files to other processors on MACC's computer system.

   Text editing and processing, database management and information handling, statistical packages and other software should be available to operate on data and information stored in MAIL messages.

7. The Mail system should be easy for people to use. Training, news and tutorials should be available on-line and require minimal investment of time on the part of the user and allow only those commands of interest to the user to be selected for explanation.

Design Features

The design features are described in groups, with each group consisting of a series of increasingly sophisticated commands.

Introduction

This sequence describes logging on and entering the mail system. It could be used by persons who are using the system for the first time.

a. LOG ON - This is the procedure to connect a timesharing terminal to the computer via a direct telephone call or a local Telenet call.

   To log on a user must provide a MACC account number, a user identification number and a password.

b. CALL MAIL - Once log on is completed all of MACC's computing resources are available to the user. The MAIL processor is invoked by typing "@MAIL". For a new user of Mail, the program asks for a name. For a user already in MAIL's directory, it displays a line of information about current mail. The following is a typical sign-on sequence for a new user. User input is shown by underlining. Other lines show the computer response.

```
@MAIL
MACC Mail 2.1      11/22/78   17:02:38
I DON'T HAVE YOUR ID ON FILE.  PLEASE TYPE
IN YOUR NAME IN THE FORM FIRSTNAME=LASTNAME

>Mary=User
YOUR NAME AS ENTERED IS:
MARY=USER
PLEASE MAKE SURE THAT IT IS SPELLED COR-
RECTLY, AND THAT THIS IS THE WAY YOU WISH
IT TO BE ENTERED IN THE MAIL SYSTEM
IS IT CORRECT?  Yes
>
```

c. HELP - This Mail command refers to an EXPLAIN command which can then be used to explain 32 other commands available in MAIL and the invocation of a five page on-line tutorial. Help also provides information on who to contact at MACC if there are problems with MAIL, various terminal controls, messages from the computer's executive system and help facilities available for MACC's computer system.

   After initial sign-on by a new user the system will associate the MAIL name (e.g. Mary=User) with the user's identification number used in the log-on procedure. At this point MAIL is now awaiting commands, as signified by the prompt character ">".

Simple MAIL Operations

Once a user has logged on to MACC's computer and called the MAIL program the following procedures could be used to send, print and delete messages, and check for incoming mail.

Sending a message

The procedure used to send a message is as follows, with the user typing the TO command.

```
>TO CHARLIE=BROWN
FROM    :MARY=USER
SUBJECT:
```

MAIL prints out who the message is from, and asks for a subject describing the message content. The subject can be up to twenty characters long. Up to 9999 lines may be entered. To complete a message, a line that contains only a period followed by a carriage return is typed. After the message is complete, MAIL asks the user if it really is to be sent. If the response is "Y" or "YES", MAIL postmarks and sends the message. If "N" or "NO" is typed, it is not mailed.

```
>TO CHARLIE=BROWN
FROM    :MARY=USER
SUBJECT:NEXT WEEK'S MEETING
ENTER THE MESSAGE, PLEASE
Let's meet about 2pm in my office.  We will
plan to discuss most of the remaining commands
Perhaps we should draw up a new workplan,
since the old one seems somewhat outdated by
now.
Mary
.
MAIL? (YES OR NO):  Yes
MESSAGE # 6 POSTMARKED 11/22/78 17:38:27
```

Checking for incoming mail

Once a user has entered the MAIL system it is useful to check for incoming mail when logging on. In fact, each mail session starts off as follows.

```
@MAIL
MACC  Mail 2.1   11/22/79 17:02:38
MESSAGE(S):  3 UNSEEN, 1 SEEN, AND 1 OUTGOING

>
```

Messages are called "UNSEEN" if they have not been read; after they are read they are called "SEEN."

Summary information concerning the messages can be obtained by using the STATUS command. There are five possible forms of this command.

```
STATUS
STATUS OF INCOMING
STATUS OF OUTGOING
STATUS OF ALL
STATUS OF <list of message numbers>
```

`>STATUS` prints the UNSEEN, SEEN, and OUTGOING line shown above.

The command

```
>STATUS OF INCOMING
```

results in the information displayed as shown in Figure 1.

In the incoming list, the "-" denotes unseen messages. The number at the left is the message number. Each message has a number assigned to it by MAIL when the program is entered or when new messages are sent or received.

```
INCOMING MESSAGES    11/22    17:06
#  ORIGINATOR         POSTMARKED  LINES      SUBJECT

2  King=Kong          11/15 23:55   21  Advice for Climbers
3 -MACC=Consulting    11/21 11:30    4  Your lost file
4 -Charlie=Brown      11/21 15:24    5  Thursday meeting
5 -Lucy=VanPelt       11/22 09:45   18  PEANUT system gripes
```

Figure 1

The STATUS OF OUTGOING command has a slightly different format, and gives date and time that the recipient first read the message text, as shown in Figure 2.

```
OUTGOING MESSAGES    11/22    17:04
#D ADDRESSEE  POSTMARKED  LINES  SUBJECT  DELIVERED
1  Don=Knuth  11/18 14:43   4     Paper  11/19 13:04
```

Figure 2

An * in the column labelled "D", indicates the recipient has deleted the message.

A maximum of 200 messages may be stored for each MAIL user. The procedure for deleting messages or saving important ones is described below.

Printing messages

The PRINT command is used to print incoming or outgoing messages at a terminal.

```
>PRINT 1, 4

# 1 TO  Don=Knuth  11/18  14:43   Paper draft

     Thank you for reading the draft of my pa-
per.  I have incorporated your corrections and
suggestions.

------- Mary

# 4 FROM  Charlie=Brown  11/21  5:24  Thursday
                                      meeting

     Can we get together on Thursday to discuss
the PEANUT system?  Several pressing issues
need to be resolved, including the implementa-
tion of some new commands.  Please let me know
as soon as possible.
```

Deleting messages

Messages can be deleted with the DELETE command:

```
DELETE <list of message numbers>
```

For example:

```
>DELETE 2:8
MESSAGE(S) DELETED: 2:8
```

Deleting an outgoing message deletes only the status entry, not the actual message. Only the recipient can delete the actual message.

QUIT

This command terminates a MAIL session.

Expanded and Additional Operations

The mail system has many other features available to the user for storing, editing, copying and deleting messages as well as for authorizing proxy users and expediting operations.

File Features

Mail can place messages in magnetic disk files which are accessible by other processors on the MACC computer.

At MACC, a file can have the following characteristics:
- temporary or permanent (saved)
- public or private.

A public file is available to all users if they know the name of the file and read or write keys. A private file is associated with and consequently only available to a single user ID.

A temporary file is only available for the duration of a computer run, while a permanent file is saved until it is deleted by the user.

Mail uses program files, which are files containing subfiles called elements.

Any program file created by a user can be used in conjunction with MAIL. In addition there is a special private file created by MAIL for each user. This private file, called SAVE$MAIL and associated with the user ID, exists as a temporary file for the duration of the computer run unless the user takes action to make it a permanent file.

File Handling Commands

CREATEFILE and DELETEFILE

The command CREATEFILE creates the permanent private SAVE$MAIL file in which to store elements beyond the immediate computer run. The command DELETEFILE deletes the SAVE$MAIL. Only one SAVE$MAIL file can be created by a given user ID. As stated above, other files independent of MAIL can be created by using MACC's regular file system and then be used in conjunction with the MAIL commands described below.

SAVE <list of message numbers> IN <file.element>

The save command causes all messages named on the list to be stored in the designated file and element.

COPY <file.element> TO <list of names>

This command causes an element of a given file to be copied from storage and addressed to the people designated as if a new message was being initiated. After the user types the subject of the message the user is notified how many lines were copied and asked if the message is to be mailed.

SHOW <file.element>

This command prints the contents of the file element designated.

CONTENTS

This command prints the names of all elements saved in the SAVE$MAIL file.

REMOVE <element name>

This command removes the named element or message from the SAVE$MAIL file.

In addition to the use of the computer system's standard files and the special SAVE$MAIL file there is a special element of SAVE$MAIL named MESSAGE that is used with the MAIL system. MESSAGE contains the current message being worked on by the MAIL program.

The commands SAVE, COPY, SHOW and REMOVE described above can designate the element MESSAGE provided by the system as if it were any other element named by the user. There is another command called GET which only works with MESSAGE and SAVE$MAIL. GET transfers an element of SAVE$MAIL named by the user into the element MESSSAGE. When the element is transferred it becomes the current message and replaces the old information residing in MESSAGE. The use of the command TO also replaces the information residing in MESSAGE with a new current message.

Conferencing and Group Messages

A powerful feature of the MAIL system is its ability to send messages to a group. A group is usually defined as an element of a file and can consist of up to 150 MAIL names.

A group element of a private file is defined by an individual user and only that user can work with that group element.

However, if a conferencing capability is required so that each participant in a group be able to send messages to the whole group, then a public file of mail names can be established by the conference organizer.

When a message is sent to a group, the sender's status list has a single entry for the entire group. However by using the STATUS command with the message number, the delivery status of each member of the group is printed. The example Figure 3 shows what the printout is for message #7 sent to a group named ALL consisting of four names.

```
>STATUS 7

OUTGOING MESSAGES    11/22  19:03
#D ADDRESSEE    POSTMARKED  LINES   SUBJECT      DELIVERED
7  GROUP: ALL   11/22 13:37   5    Book clubs     S: 4  R: 1

   Nat=Hawthorne
   Jane=Austen
 * Walter=Scott                                   11/22 18:37
   Emily=Bronte
```

Figure 3

Under the DELIVERED column "S:" indicates that four messages have been sent and "R:" indicates that it has been received by one person. "Walter=Scott" has read the message and deleted it as indicated by the asterisk next to his name, under column D.

Mail also has simultaneous conferencing capability to notify a user during a MAIL session of the arrival of a message. The user can select varying degrees of detail in the notification. The NOTIFY command with its selected options will:

1) announce the arrival of a message with its number, or

2) print the message number, who the message is from, its length and provide a yes/no prompt to print the message text, or

3) print the complete message.

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Editing Messages

MAIL messages may be edited using MACC's text editor program EDIT. This program is external to the MAIL system but linked to it with the command EDIT.

Mail offers an on-line tutorial on how to use the EDIT program. EDIT works on the current messages or other elements retrieved from the SAVE$MAIL file. Of course other independent files established with the MACC operating system can be edited and operated on by the full array of MACC's processors and programs and then copied to the SAVE$MAIL file.

Miscellaneous Features

A number of features exist that allow the user to expedite operations, use MAIL more inexpensively, or be authorized to use MAIL as someone else.

@MAIL options

When invoking the MAIL program options may be used to automatically provide status information or print messages.

@MAIL,P will call mail and print messages that have arrived since the user's last log on.

The I option (@MAIL,I), will show the status of incoming messages, and the O option (@MAIL,O) the status of outgoing messages, without the need for the status commands.

The Z option (@MAIL,Z), will allow a user currently logged on to appear to MAIL as another name, provided the other name person has entered the current user's ID in the system during a previous MAIL session. The current user is then authorized to use the other name for MAIL purposes only.

Three commands are available to the person authorizing the use of his or her name by another user.

ENTERID - authorizes a given user ID to use the current name.

LISTIDs - lists all the user ID's authorized to use the current name.

REMOVEID - removes the authorization of a given user ID.

These authorization commands are only to the owner of a user ID/mail name combination.

SEEN and UNSEEN Filters

When used with the PRINT, STATUS or DELETE comments these words refer to all messages of the specified category.

Other Commands

The following commands are also available.

LIST - lists messages on a remote printer.

RESEQ - renumbers status lists consecutively.

NEWS - provides information about recent changes to MAIL.

Command Summary

The following is a summary of all MAIL commands. (Upper case positions of the command indicate allowable abbreviations.)

CONTENTS . . . . List names of SAVE$MAIL elements

Copy <file.element> TO <people> . . Mail stored message

CREATEFILE . . . . Create a permanent file SAVE$MAIL

Delete <message list> . . . Delete the named messages

DELETEFILE . . . . Delete SAVE$MAIL.

EDIT . . . . Enter 1100 Editor to edit message

ENTERID <user id no> . . . Authorize this number to use your Mail name

Explain <command name> . . . Online explanation of any command

GET <element name> . . . . Copy element from SAVE$MAIL into SAVE$MAIL.MESSAGE

HELP . . . . Get information about Mail and various computer responses

List <message list> . . . List messages on remote printer

LISTIDS . . . . List all user ids authorized to use your Mail name

MAIL . . . . Mail an already composed message

NEWS . . . . Get information about recent changes to Mail

NOTIFY <SKIP/PROMPT/PRINT> <ON/OFF/nothing> . . . Notify you of messages that arrive while you're using Mail.

Print <message list> . . . Print messages.

QUIT . . . . Terminate the Mail session.

REMOVE <element name> . . . Remove an element (message) from SAVE$MAIL.

REMOVEID <user id no> . . Remove id from those authorized to use your Mail name.

RESEQ . . . . Renumber status lists consecutively.

Save <message list> IN <file.element> Save messages in a file.

Save MESSAGE IN <file.element> Save current message.

SHOW <file.element> . . . Print the text of an element.

STatus
STatus of <ALL/INcoming/OUTgoing>
STatus of <message list> . Summary information about current mail.

TO <people> . . . . Compose and mail a message.

Costs and Usage

Not only must computer mail service provide the appropriate features and be easy to use, but it must also be cost-effective if it is to survive in the market place of competing systems. It must be capable of modifications and enhancements as new ideas and requirements develop for its use.

Costs

There is no initiation fee to use MACC's computer, or subscription fee to use any of the software resources such as MAIL. MACC's MAIL system is simply one of MACC's many software resources.

The use of MAIL is charged for in the same way that charges are made for other computing resources. Charges are made for CPU, I/O, memory, magnetic disk file space, software support, connect-time and several other items.

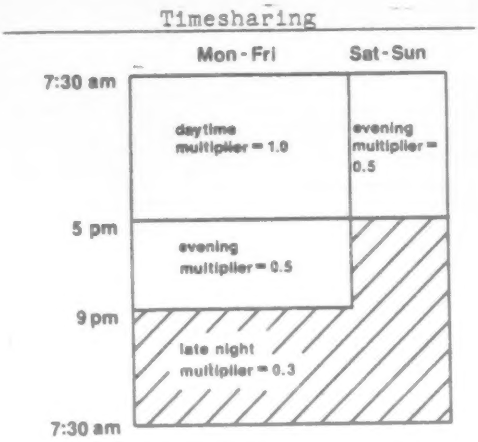
However, for the MAIL user a cost breakdown showing the charges for machine and software resources does not help much in adopting a mode of operation that results in the most cost-effective use of the system. To provide cost information that is more meaningful to a MAIL user we have taken each command and measured the total cost incurred by using it, even though these total costs include the variety of machine and software resources involved in running the program.

It should be noted that the costs indicated below are based on MACC's standard rate structure. These costs would be modified depending on two separate categories: type of user and class of service.

The table shows a rate multiplier applied to all charges depending on the type of user.

Type of User	Rate Multiplier
Madison Campus	1
Other UW System Units	1.27
External-nonprofit	1.49
External-commercial	3

The chart below shows the rate multiplier applied to all charges depending on the time of day and day of week that interactive terminals are connected to MACC.



1. Rates are charged according to the time a timesharing run signs on.

2. Late night rates are charged on those holidays MACC is open.

Overall Cost Data

Based on an observation of approximately 200 runs for one specific group of MAIL users, the following overall cost data has been calculated and projected for July 1, 1980 rates for MAIL by Madison campus users.

Average Hourly Cost	$9.15/hour
Average Run Cost	$1.20/run
Average Run Time	7.7 minutes

External users and those who use TELENET for communicating with MACC will see increases or decreases in the above costs for the various classes of users and time of day the program is used, as described above.

Costs of Individual Commands

In general the cost for individual commands will vary about some average value. This variation depends on the particular instant that a message or command is received by the timesharing system. Although we have not taken enough observations to be definitive, the data we have suggests that the variations are normally distributed. The costs and cost trends shown below are rough approximations based on approximately six observations per command.

LOG ON

This operation appears to cost about $.03 and is fairly consistent.

@MAIL

The cost to call the MAIL program is approximately $.23, although costs for less than this amount have been observed.

TO/MAIL

This command to enter and mail a message to one individual shows cost varying considerably above and below $.23. Costs varying from $.12 to $.51 have been observed. This cost is relatively independent of the number of lines in a typical message (less than 100 lines) since the data transfer costs are a small percentage of the cost for executing the commands.

The cost to send a message to more than one person or a group is slightly more than the the cost to send the message to one person. Thus the cost per person to send a group message is almost inversely proportional to the number of persons in the group.

STATUS

This command exhibits a cost that is essentially independent of the number of messages displayed. This cost varies widely, ranging from $.06 to $.46.

PRINT

This command will show a cost variation roughly proportinal to the number of messages printed, and is essentially independent of the number of lines in the message. The cost to print one message is approximately $.11.

DELETE

The cost for this command is roughly protional to the number of messages deleted, with a variation from $.06 to $.28 per message.

EXPLAIN

This command is quite inexpensive, usually being less than $.10 for each command explained.

The remainder of the commands that were measured for costs were:

HELP
SHOW
DELETEFILE
CONTENTS
RESEQ
CREATFILE
COPY
SAVE
GET
REMOVE

All of them show costs of less than $.25 each to execute. Errors in a command cost less than $.10; and finally QUIT costs less than $.12.

To minimize costs, two operational approaches are evident from these observations.

1. Group messages are quite inexpensive; suggesting that the conferencing costs for the system will be inexpensive.

2. Multiple messages going to the same addressee should be contained in a single overall message.

Mail Usage Statistics

The usage of MAIL was monitored for two full weeks from February 23, 1980 through March 7, 1980. The monitoring consisted of recording a trace entry for each login or logout of MAIL and for each command executed. Each trace entry was stamped with the date and time it was recorded. Reduction of the trace data resulted in the information in Table I.

Table I
Mail Usage Statistics

Number of registered users	387
Number of users inactive since 12/1/80	29
Number of new users	14
Number of active users	202
Avg. number of sessions per weekday	149
Avg. number per weekend day	23
Avg. number sessions/user/day	1.9
Avg. session length	4.6 minutes
Avg. number commands/session	3
Avg. number messages sent/session	.36
Fraction of messages with more than one addressee (a 'group' message)	8%
Avg. number recipients/group message	18
Avg. message length (all messages)	17 lines
Fraction of sessions with new messages	35%
Avg. number of arrivals since previous session	.67
Avg. number of messages retained	23

As expected the majority of MAIL sessions took place during the weekdays during normal working hours. (Roughly 90% of all sessions were between the hours of 8 AM and 7 PM Central Time.) There was an average of 8.7 logins/hour during normal working hours. With a typical session lasting only 4.6 minutes, it was not surprising to find that Mail was not used for conferencing - the opportunity did not arise. Even during the peak time of 1 to 2 PM there was only an average of 1.13 users signed on at any given time.

Part of the low use as a conference capability may be due to the fact that there are no facilities for the user to determine if another user is active. MACC plans to make modifications to the Univac operating system so that these capabilities are present, and available to users of Mail. At that time, we can expect an increase in conferencing.

As shown in Table I, 65% of the Mail sessions were started with no arrivals since the user's previous session. Many users sign into Mail to just check if they have received any new messages. There is a potential for a considerable cost savings when we implement the changes to the operating system that will notify a user of new messages without having him or her actually log in to Mail.

As expected, we found that the most popular Mail commands were Print, To/Copy, Mail, Delete and Status, accounting for 76% of all commands executed. Quit, Show, Explain, and Save were responsible for 16% more of the command usage, resulting in only 8% for all other commands. In short, there is very little other than the simplest use of Mail. People send messages, print them, delete them and check their status.

The only real surprise of the monitoring was the number of messages that people allowed to accumulate in their message lists. As seen in Table I there was an average of 23 messages in the message lists at signon, with one user who had accumulated 172 messages in his list! It was clear from this that the users need some incentive to delete old, and we presume, unnecessary messasges. If the messages are needed, then the user should be saving them in their own files at their expense, or paying MACC for the file space that they are using by not deleting them. Hopefully, the new charging mechanism described elsewhere in this paper will provide the necessary incentive.

Planned Enhancements

In order to make MAIL more attractive to users some further development is being planned. It is hoped that the features described below will make MAIL a more useful tool, and more cost-effective.

Who Else is Currently Using MAIL?

It has been our suspicion (and proved to us in collecting the usage data for this paper) that with the immediate notification mode of MAIL (conferencing) it is difficult, if not impossible, to know if someone is logged onto MAIL at the same time you are. We therefore will be implementing a WHO command which will give a list of all users currently logged into MAIL.

Check/mail Without Invoking MAIL

It is often the case that a user wants only to check to see if there are any incoming messages, but does not plan on sending any unless a response is in order. Currently, it is necessary to do a @MAIL call to check for new messages. To make it easier and cheaper to know whether you have mail, the MACC 1100 operating system is being modified so that whenever you submit a run you will be notified if you have mail. Then and only then will you have to do an @MAIL call to see your mail. This will save the cost of calling when there are no new messages (about $.23).

Forwarding Messages With a Cover Note

To handle the situation where a user receives a message that he or she wishes to send to someone else, we will provide the FORWARD command. This command will give the user the opportunity to add a preface to a message with a new subject and send it to someone else.

Mail Directory

At present, a directory of MAIL users is maintained separately from the MAIL system. Therefore, to know who else is a user of MAIL, a user has to exit MAIL and execute a special program. This is inconvenient and has the disadvantage of not being updated as a new user signs in. To solve this, an online directory will be incorporated into MAIL with special commands for searching for a particular name. In addition, each user will have the option of not having his or her name listed, and the ability to change from listed to unlisted at any time.

Group Changes

Creation of a group in which the names in the group can be changed must currently be done outside of MAIL using some other program. A CREATEGROUP and a CHANGEGROUP command will be implemented so that group members may be added, removed and maintained without exiting MAIL and without having to know about any other program.

Integrate Editing in MAIL

Currently, the EDIT command takes the user out of MAIL and initiates the editing of SAVE$MAIL.MESSAGE, the current message element using the MACC editor. We propose to design an editing capability within MAIL so that the user does not have to terminate a MAIL session to make simple changes to messages. The editing capability will allow the user to make changes to messages while composing them in the execution of the TO command, rather than afterwards. The MAIL editor will also be used for the CREATEGROUP and CHANGEGROUP commands mentioned above.

More Equitable Charges For Message Storage

A change will be made in the way we charge for message storage on magnetic disk. At present, the user is charged a fixed amount of ten cents in the form of a "shared file charge" each time the mail message file is made available to the user (once per MAIL session). We have found that we are not recovering costs suffieciently through this mechanism. The present charge is also not fair to the low volume user of MAIL who does not store many messages. Therefore, to recover costs and to encourage users to delete messages (to keep the file size down) and to provide a fair charging mechanism based on actual usage, we propose to charge a fixed amount (on the order of one cent) for each message that exists in a users status list each time he or she signs on to MAIL.

COMPUTER-AIDED TELECOMMUNICATIONS FOR THE DEAF
(A PROTOTYPE FOR THE HEARING)

Mary J. Robinson
Assistant Director
HEW/OTP Project
(Office of Telecommunications Policy)
Deaf Community Center
Framingham, MA

"DEAFNET" is an innovative application of electronic mail via a computer system to provide the deaf with an easy form of personal communication and to bring a flow of information into their lives. The method can benefit other handicapped groups such as the deaf/blind and wheelchair-bound persons and may very well become a prototype for the non-handicapped hearing world. The deaf population was chosen as the target group for this demonstration due to its very limited communication opportunities and the barriers imposed by their world of silence.

Present Deaf TTY Network

Presently, deaf people can communicate on the telephone, using a specially designed acoustic coupler and a second-hand teletypewriter, surplus from the Bell system, with anyone having similar equipment. Although fairly successful and used now by over 50,000 deaf people, this method of communication has serious problems. The most important one is that the system was based on outmoded equipment that is no longer manufactured, and is based on a design feature (called 5-level or Baudot code) that is almost obsolete and not compatible with modern data transmission standards. A second problem results from the mechanical models which are bulky, noisy, and not very reliable. Another difficulty is finding spare parts for maintenance of these surplus TTYs which are 15-30 years old. Also, the geographic area has grown to such an extent that volunteer repair people cannot cover all of the territory. The last but not the least of the significant concerns are the high toll charges incurred due to the time required for a typed conversation (perhaps 4 times as long as a spoken conversation) -- which is a deterrent to using TTYs.

Various electronics companies have designed and manufactured small light-weight devices that function on the Baudot code. These new units are compatible with the different models presently in use by the deaf throughout the country. These devices will improve the reliability of telephone communications but may prevent the deaf from ever participating in the new computer technology presently exploding all around us and soon to be an intimate part of our everyday lives.

With the surplus TTYs becoming harder and harder to obtain, and electronic 5-level devices becoming more and more expensive, their rising cost will eventually meet the descending cost of home mini-computers. These developments will have a profound effect upon the deaf telecommunications network as it exists today.

Communication Barriers Caused by Deafness

One of the most serious consequences of deafness in today's world is the lack of information, such as up-to-date news and weather reports that are usually broadcast hourly and general medical, legal, and consumer information that is often included in radio and TV programs. Because of this lack of information, the deaf person lags behind his hearing neighbor and co-worker in knowledge which could improve his employment opportunities and his salary level. The feelings of frustration and dependence on others are heightened by the feeling of isolation from the world at large.

The deaf person who is unable to hear the radio weather report in the morning upon wakening is also unable to call the telephone weather number and must instead look at the sky and hope his guess is right. He has not heard the latest ballgame score and so cannot enter into coffee-time conversation with his fellow workers. When that conversation turns to the latest current events, again he is an under-informed citizen and the isolation from his hearing co-workers increases. Unaware of the latest legal rights legislation, he does not know he is entitled to an interpreter for a work seminar on upgrading his employment skills, so he remains underemployed.

A recent study by NBC reports that:

95% of the cars in America have radios;

90% of people who go shopping drive; and the car radio is used during 62% of driving time;

60% of radio listening is done in the home;

20% in the car and 20% elsewhere.

No Wonder Hearing People Are So Well-Informed!

Modern Technology Changes Ways People Communicate

In recent years, there have been various attempts using modern technology to help overcome the communication barriers of deafness in daily living. None have had the far-reaching impact that the computer and an electronic message system can have on those never able to use the telephone for voice communication.

For the first time a new communication technology promises to mean as much, or perhaps more, to the deaf as to the hearing. Unlike the telephone, radio, or TV, computer-based message technology will not isolate deaf people further from hearing people. On the contrary, we can improve communications between the deaf minority and the hearing community at large by providing adequate access between deaf people and friends, relatives and fellow employees of the members of the deaf community.

DCC DEAFNET Demonstration

Since April, 1978, the Deaf Community Center (DCC) has been operating a demonstration to evaluate the usefulness and effectiveness of computer-assisted telecommunications for the deaf. Funds for the project are provided by a grant from the HEW Office of Telecommunications Policy (OTP). Using leased computer resources and the HERMES message system developed by Bolt Beranek & Newman, Cambridge, MA, the demonstration has interconnected individual deaf users, state agencies for the deaf, schools for the deaf, a hospital, a museum, a television station caption center, a university, and other institutions. Through the use of telephone lines, a person can dial a central computer and then exchange private messages or get public messages (from a bulletin board). The demonstration uses ASCII (8-level) terminals, in contrast with most telecommunications devices for the deaf, which use Baudot (5-level).

HERMES Message System

HERMES assists the user to compose messages, correct typing or spelling errors, format and justify the margins, and then distributes the messages to the addressee. The user can carbon copy himself or several others; he can also multiple-address messages by using a previously prepared list. When he receives a message, a simple command allows him to reply to or forward it to another person.

When a HERMES message is typed by a sender, it is not transmitted to the recipient's terminal, but is stored in a file within a computer system. This message, along with any other mail that has accumulated, is read when the addressee dials the computer and is informed that there is new mail in his computer "mail box". By typing a simple command, he surveys a list of those messages and then may request that any or all of them be printed out at his terminal.

Advantages of Computer Message System

One key advantage of a computer message system is that the recipient need not be present when a message is sent. In his absence, the message is retained automatically in computer memory and is available on demand when he returns.

What other advantages does a computer-assisted system offer that is different from the present Baudot TTY communications network?

1. Communication	transfer of messages electronically at high speed
2. A Bridge	between 5 & 8-level, between hearing & deaf-including friends, relatives, employees of deaf people, between hospitals, other institutions & deaf,
3. Information	daily news, weather, sports, deaf community info - i.e., community mtgs. and socials

4.	Home Education	computer-aided instruction, including improvement of writing skills
5.	School Education	language-adjusted current events, math, science, English practice exercises
6.	Home Employment	opportunity to earn money and learn new skills via telephone hookup
7.	Other Handicapped	useful to deaf-blind, including persons with severely limited vision, persons confined to wheelchairs, and persons with other disabilities that limit their mobility

Breaking Down Communication Barriers

Although the immediate appeal to the user is exchanging messages with friends, one of the most useful accomplishments is the speed of sending emergency announcements. Consider if you will, the fact that many members of the deaf community have gone through 12 years of school together, and while some of them may move to different geographic locations, as a group, they remain close-knit. Birth, marriage, and death announcements are a vital part of their lives -- but until the advent of electronic mail, several days could pass before important events were known.

This is more dramatically illustrated in the case of the death of a political figure such as John F. Kennedy, when many deaf people did not learn of the tragic event until 2 or 3 days later.

Where would you go for entertainment if you could not hear? Listings of captioned movies, notices of interpreted lectures, tours, meetings, church and social activities are not listed in public newspapers. The radio is useless if you are deaf. Captioned TV has had some such news, but only once a week -- usually at a very late hour, such as 11:30 PM or midnight. This information is a high priority need for the deaf and can easily be provided in a computer data base.

Emergency announcements of weather changes such as hurricane warnings, snow storms, dangerous driving conditions, school and meeting cancellations are other bits of vital information unavailable to deaf people via present broadcast media. Alternate forms of information like many of the popular auditory dial-up tape services for medical, legal, and consumer information are inaccessible to the hearing-impaired.

Hearing relatives, friends, and employers can communicate quickly and easily when all are on the same system. The system, in turn, offers its computer "goodies" to the hearing community: latest local, national and world events, sports and weather reports -- all are as useful to the hearing as to the deaf.

For obvious reasons, radio and non-captioned TV programs never reach the deaf. Much of today's information is broadcast in this manner, effectively shutting out the deaf, while the hearing are offered vast amounts of information to assist their learning process and thus function more effectively in society.

While Cable TV does provide captioned news, etc., from which the deaf can benefit, it does not offer CAI (computer-aided instruction) which could upgrade a deaf person's educational and employment skills.

Education for the Handicapped

There is a special need for English language instruction for deaf children and adults. School instruction is important but other forms of language tutorials should be available to make the deaf person a fluent writer and capable reader. Plans are underway to present through DEAFNET a specially designed tutorial for both the production and comprehension of written English. The project, entitled ILIAD (Interactive Language Instruction Assistance for the Deaf), which is being developed under a special HEW/BEH (Bureau of Education for the Handicapped) grant to the Boston University School of Education) will be tested and evaluated by present DEAFNET users with an eventual goal for final implementation in a desk top microcomputer with a TV terminal. Most of the system components would be directly usable by any students (deaf or hearing) who wish to test or exercise their command of English.

There are many Computer-Aided Instruction (CAI) programs available, but none written with such a significant impact for the deaf community as the two described here. Both the ILIAD program and the LAN (Language-Adjusted News) are available in the demonstration DEAFNET.

Deaf people are tremendously disadvantaged in gathering and exchanging information due to their inability to hear. Deaf people whose reading level hinders and often prevents them from understanding newspapers and other print materials have had no easily understood source of news until this experiment with Language-Adjusted News (LAN). They have been able to gather only bits of information or misinformation, depending on friends or relatives for explanations, or else have lived unaware of world events.

For each regular news story that is entered into the system by the staff at the Caption Center at WGBH (Boston), a linguistically controlled version is prepared with careful attention given to control of vocabulary, syntax and inferential content of original materials.

The news service is an educational resource for adults and young people. This news is used at the schools on the system as independent reading material, or as lessons for Social Studies, English or reading classes. This service demonstrated the DEAFNET's capability of providing useful information to this population.

Value to Deaf Individual

The following comments were made by different users participating in the demonstration:

"A valuable addition to my daily living. I am becoming more and more independent."

"Reading and writing (or typing) has increased my writing and composing ability. I can see the improvement myself."

"A plus in my daily living. If there could be more people on the system, it could be even more valuable. It has been a real privilege to be a participant in this project."

"I'm happy that people are beginning to recognize the valuable part telecommunications can and will play as a means of communication for the deaf."

"I know from working in an office that it's frustrating trying to contact people when they're not there. HERMES obviously eliminates that."

"HERMES has given me almost equal accessibility to the many things that were not easily accessible or available to me before, such as legal, medical, and social information I never had before."

Service Providers Comments

The "Hearing Public" providing information on the system for deaf people indicated:

"HERMES gives us yet another way to interact with the deaf community."

"HERMES has helped us to understand some of the needs of the deaf community. If it had not been for HERMES, I am sure we would not be developing programs for the deaf community."

Usefulness to State Agencies Serving the Deaf

It has been possible for offices directly serving the deaf community to retain better liaison with each other and their deaf clients by using the electronic mail. When these offices have important notices or information, they are able to quickly disseminate it on the network. Committee work is efficiently carried out and even the rapid exchange of reports and proposals is completed.

DEAFNET Potential in Massachusetts

The present DEAFNET is small (the demonstration has less than 100 people) but the potential is unlimited. In the state of Massachusetts alone, the deaf population is 39,000 and the hearing-impaired (the person who has difficulty using hearing alone for getting information) number 297,000 -- a substantial figure to warrant exploring the future potential and economic viability of electronic mail.

Economic Viability

Aspects to study for the future are trends in technology:

What are the costs of electronics equipment? Can a service such as DEAFNET stand on its own feet economically?

For the near term, it seems likely a government subsidy is needed; for the longer term, there is a real possibility that electronic mail services for the deaf could possibly piggyback on similar services for the public generally. To serve the deaf adequately, means must be found so that the deaf have access to the hearing community.

Since it is possible that the interfaces needed by the general business community for electronic message systems are not too different from electronic message systems for the deaf, a marriage between the two is a viable solution.

Deaf Communications Institute (DCI)

The people served by the DEAFNET project believe that their demonstration to date has been a success and they want to continue as well as expand the work that the project has begun. For this reason, the deaf users have formed a community board and incorporated as a non-profit corporation named Deaf Communications Institute (DCI).

DCI is seeking a government grant for construction of a permanent computer facility, to be owned and administered by the new corporation and controlled by the deaf. The computer facility that will constitute the "nerve center" of the Electronic Message Service" will be installed in a central facility at Deaf Community Center in Framingham and will service the Eastern Massachusetts area. Five-year plans include the incorporation of mini-computers into the network at nodes in the Western part of the state and the possibility of servicing all of the deaf in the state via electronic mail on a computer.

A proposal is presently being considered for an "Advanced Telecommunications System" for Rehabilitation offices in the state which will not only provide an internal communication system for counsellors and administrators, but provide access to deaf clients on the system. Computer service charges for such a system could provide "prime" daytime communication service to a state agency and "off-hour" communication service to the deaf users and the hearing community for a monthly service charge that would be affordable because of this concept of a shared resource.

DCC continues the third and final year of the demonstration grant and seriously looks at the role private enterprise can play in picking up services such as this to make them more viable. It is important for data processing firms and computer and terminal manufacturers to be aware of the telecommunications needs of the deaf community and to become actively involved.

Future use of electronic mail services will not be limited to the deaf. Message systems are available and their growth will be prolific in the next few years; but they need to be tailored to actually support and fit the deaf community while still remaining useful to the hearing community. This is the first time the deaf have had an opportunity to be leaders in communication. It represents a breakthrough in modern technology and a strong effort to bring the deaf and hearing worlds closer together in the mainstream of life -- sharing the vast world of knowledge and information that is growing at an incredible rate.